

Alaska Fisheries Data Series Number 2003-1

**Abundance and Run Timing of Adult Pacific Salmon in the Tuluksak River, Yukon
Delta National Wildlife Refuge, Alaska, 2002**

By

Kenneth S. Gates
and
Ken C. Harper

*U.S. Fish and Wildlife Service, Kenai Fish and Wildlife Field Office
P.O. Box 1670 Kenai, AK 99611*

February 2003

This project (FIS 01-053) was funded under cooperative agreement 7018115330 between the U.S. Fish and Wildlife Service, Office of Subsistence Management, and Tuluksak IRA Council. The cooperative agreement provides funding to the Tuluksak Native Community. Tuluksak Native Community as a full cooperator hired four personnel and purchased weir equipment. Four personnel from Tuluksak worked at the weir during various times throughout the season under the supervision and training of the U.S. Fish and Wildlife Service.

Acknowledgements

The success of this project hinged on the cooperation between all parties involved. We would like to thank Tuluksak Native Community (TNC), especially Moses Peter, for their cooperation and project support. Charlie Alexie, David Andrew Jr., Eric Alexi, and Peter Alexie, all TNC technicians, were all very valuable during the field season and provided great assistance with weir operations.

Special appreciation is extended to Kenai Fish and Wildlife Field Office staff. We are very indebted to Anne Barrett for her administrative support throughout the entire year. In addition, a special thanks is extended to Ty Wyatt, Martin Melville, Rebecca Smith, and Caroline Jezierski, U.S. Fish and Wildlife Technicians, for their endless efforts in project setup, operation and removal of the weir.

We also appreciate the assistance that Doug Molyneaux and staff, Alaska Department of Fish and Game, Commercial Fisheries Division, Kuskokwim Area, had given us throughout the season and during the post- season scale analysis.

The Alaska Fisheries Data Series was established in 1994 to provide public access to unpublished study results. These reports are intended to document short-term field studies limited in or lacking statistical interpretation. Reports in this series receive limited internal review prior to release and may be finalized in more formal literature in the future. Consequently, these reports should not be cited without approval of the author or the U.S. Fish and Wildlife Service.

Disclaimer

The mention of trade names of commercial products in this report does not constitute endorsement or recommendation for use by the federal government.

The correct citation for this report is:

Gates, K; K. Harper. 2003. Run Timing and Abundance of Adult Salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 2002. U.S. Fish and Wildlife Service, Kenai Fish and Wildlife Field Office. Alaska Fisheries Data Series Number 2003-1, Kenai, Alaska.

The U.S. Department of Interior prohibits discrimination in Departmental Federally Conducted Programs on the basis of race, color, national origin, sex, age, or disability. If you believe that you have been discriminated against in any program, activity, or facility operated by the U.S. Fish and Wildlife Service or if you desire further information please write to:

U.S. Department of Interior
Office of Equal Opportunity
1849 C Street, N.W.
Washington, D.C. 20240

Table of Contents

Acknowledgements.....	ii
List of Figures.....	v
List of Appendices	vi
Abstract.....	1
Introduction.....	2
Study Area	3
Methods.....	4
Weir Operations	4
Biological Data	4
Results.....	6
Weir Operations	6
Biological Data	7
Chum Salmon.....	7
Chinook Salmon.....	9
Sockeye	11
Pink Salmon	11
Coho Salmon.....	11
Resident Species	13
Discussion	13
Weir Operations	13
Biological Data	13
Chum Salmon.....	13
Chinook Salmon.....	14
Sockeye Salmon.....	15
Pink Salmon	15
Coho Salmon.....	16
Recommendations For 2003	17
References.....	18

List of Figures

1.- Tuluksak River drainage on the Yukon Delta National Wildlife Refuge, Alaska.	3
2.- Average daily water temperatures and average daily water depths in the Tuluksak River, 2002.....	6
3.- Weekly escapement of chum salmon through the Tuluksak River weir during 2002...	7
4.- Estimated sex composition of chum salmon over time, Tuluksak River, 2002.	8
5.- Cumulative proportion of daily chum salmon passage and chum salmon carcasses washing onto the upstream side of Tuluksak River weir, 2002.....	9
6.- Weekly escapement of chinook salmon through the Tuluksak River weir during 2002.....	9
7.- Cumulative proportion of daily chinook salmon passage and carcasses washing onto the upstream side of the Tuluksak River weir, 2002.	11
8.- Weekly escapement of coho salmon passing the Tuluksak River weir during 2002.. .	12
9.- Cumulative daily counts of chum salmon counted through the Tuluksak River weir during 1991, 1992, 1993, 1994, 2001, and 2002, where 2001a represents the cumulative estimated daily escapement for periods prior to weir installation and during high water.	14
10.- Cumulative proportion of chinook salmon escaping the Tuluksak River weir during 1991, 1992, 1993, 1994, 2001, and 2002 where 2001a represents the cumulative estimated daily escapement.....	14
11.- Cumulative proportion of coho salmon passing the Tuluksak River weir during 1991,1992, 1993, 1994, 2001, and 2002 where 2001a includes estimates for uncensused days.....	16

List of Tables

1.- Length-at-age for chum salmon sampled from the Tuluksak River weir, 2002.....	8
2.- Length-at-age for chinook salmon sampled from the Tuluksak River weir, 2002.....	10
3.- Length-at-age for coho salmon sampled from the Tuluksak River weir, 2002.....	12

List of Appendices

1.- Average daily water temperatures and depth in the Tuluksak River, 2002.....	21
2. Daily escapement of salmon and resident species at the Tuluksak River weir, 2002. .	22
3. Chum salmon daily and cumulative counts and cumulative proportion passing through the Tuluksak River weir, 1991-1994, 2001 and 2002.	25
4. Estimated age and sex composition of chum salmon passing the Tuluksak River, Alaska, 2002, and test of age composition between sexes.	28
5. Chinook salmon daily and cumulative counts and cumulative proportion passing through the Tuluksak River weir, 1991-1994, 2001, and 2002.	32
6. Estimated age and sex composition of chinook salmon passage from the Tuluksak River, Alaska 2002 and test of age composition between sexes.....	36
7. Sockeye salmon daily and cumulative counts and cummulative proportion passing the Tuluksak River Weir, 1991-1994, 2001 and 2002.....	40
8. Pink salmon daily and cummulative counts and cumulative proportion passing the Tuluksak River Weir, 1991-1994, 2001, and 2002.....	44
9. Coho salmon daily and cumulative counts and cumulative proportion passing through the Tuluksak River weir, 1991-1994,2001, and 2002.	48
10. Estimated age and sex composition of coho salmon passing the Tuluksak River, Alaska, 2002, and test of age composition between sexes	52
11. Daily and cumulative counts and cumulative proportion of salmon carcasses passing the Tuluksak River weir, 2002.....	54

**Abundance and Run Timing of Adult Pacific Salmon in the Tuluksak River, Yukon
Delta National Wildlife Refuge, Alaska, 2002**

Kenneth S. Gates
and
Ken C. Harper

*U.S. Fish and Wildlife Service, Kenai Fish and Wildlife Field Office
P.O. Box 1670 Kenai, AK 99611*

Abstract

A resistance board weir was installed and operated in the Tuluksak River between June 10 and September 10, 2002 to enumerate adult salmon and collect biological data. This project involved a cooperative agreement between the U.S. Fish and Wildlife Service and Tuluksak Native Community. Data collected were used in-season to manage the commercial and subsistence fisheries in the Kuskokwim area.

Water and temperature levels fluctuated during weir operations ranging from 0.29 meters and 8.3°C to 1.05 meters and 15.6 °C. A total of 9,958 chum *Oncorhynchus keta*, 1,346 chinook *O. tshawytscha*, 82 sockeye *O. nerka*, 27 pink *O. gorbuscha* and 11,487 coho salmon *O. kisutch* were counted during the 2002 field season. Coho salmon passage was highest on record for all years of recorded data. In addition to salmon, two Dolly Varden *Salvelinus malma*, seven white fish *Coregonus* and *Prosopium* spp, and five arctic grayling *Thymallus arcticus* were passed through the weir.

Age, sex, and length data were collected from 1,057 chum salmon, 215 chinook salmon, and 531 coho salmon. Four age classes were identified for chum salmon, six for chinook salmon, and three for coho salmon. It was estimated that female chum salmon made up 44% of the chum run, female chinook salmon made up 24% of the chinook run, and female coho salmon made up 58% of the coho run. In sampled fish, male chum salmon were significantly larger than females for ages 0.2, 0.3, and 0.4 fish and there was a significant difference in age composition between sexes. Female chinook salmon were significantly larger than males for age class 1.4 fish and there was a significant difference in the age composition between sexes. Coho salmon age compositions did not differ between sexes while mean lengths for 2.1 and 3.1 coho salmon did differ between sexes.

Introduction

The Tuluksak River, located approximately 218 river kilometers (rkm) upriver from the mouth of the Kuskokwim River, Alaska, flows through the Yukon Delta National Wildlife Refuge (Refuge) and is home to chinook, chum, pink, coho, and a small population of sockeye salmon. These salmon contribute to large subsistence and commercial fisheries in the lower Kuskokwim River drainage. In addition to human consumption, salmon provide food for brown bears *Ursus arctos* and other carnivores, raptors and scavengers. Salmon also sustain resident fish species and salmon fry that rely heavily on the nutrient base provided by salmon carcasses (U.S. Fish and Wildlife Service 1992).

The salmon fishery in the Kuskokwim River drainage is cooperatively managed by the Alaska Department of Fish and Game (Department), the U.S. Fish and Wildlife Service (Service), and the Kuskokwim River Salmon Management Working Group (Working Group). The goals of the Department, Service, and the Working Group are as follows in order of importance: (1) To manage for the escapement necessary on all the spawning grounds for all species of salmon to provide a sustained yield; (2) To manage for adequate subsistence yield for all species of salmon; (3) To manage for the optimal economic benefit from the commercial fishery after escapement and subsistence needs are assured (ADF&G 2000). In addition to the goals set by the Department and the Working Group, the Alaska National Interest Lands Conservation Act (ANILCA) mandates that salmon populations and their habitats be conserved in their natural diversity within the Yukon Delta National Wildlife Refuge.

To manage for sustained yields of all individual salmon stocks, managers need escapement data and migratory timing of individual stocks accompanied by sex and age composition throughout the migratory period. Managing for all individual salmon stocks can be difficult since salmon stocks are mixed during the annual migration up the Kuskokwim River, increasing the potential for smaller salmon stocks to be over harvested during periods of commercial and subsistence fishing. Therefore, area managers attempt to conserve these smaller salmon stocks by distributing harvest accordingly throughout the entire salmon run.

In previous years, salmon escapements were monitored using aerial index surveys and a resistance board weir in the Tuluksak River. Aerial index surveys started in 1965 and occurred sporadically until the early 1990's. Surveys were infrequently used for in-season management of the Kuskokwim River fishery because the surveys, often occurred after the commercial fishing season.

A resistance board weir was used between 1991 and 1994 and in 2001 to obtain more accurate salmon escapement data in the Tuluksak River. Weir escapements for chum salmon were at least five times greater than aerial index surveys during 1991 and 1992 and chinook salmon escapement was two and six times greater than aerial index surveys during 1991 and 1992 (Harper 1997). A weir-monitoring project was not in place on the Tuluksak River between 1995 and 2000.

The Service and the Village of Tuluksak initiated a cooperative escapement project beginning in 2001 to meet the goals of the Service and Working Group and the mandates of ANILCA. The project objectives are to: (1) count the daily passage of chinook, chum, pink, sockeye, and coho salmon and resident fish species through a weir on the Tuluksak River; (2) describe run-timing using daily passage counts of chinook, chum, pink, sockeye, and coho salmon passing through the weir; (3) estimate weekly age and sex composition of chinook, chum, pink, sockeye, and coho salmon passing through the weir; (4) determine the length of chinook, chum, pink, sockeye, and coho salmon by age and sex; (5) enumerate chinook, chum, pink, sockeye, and coho salmon carcasses washing onto the weir each day; (6) sample resident fish on an opportunistic basis. These data will aid in the in-season management of the Kuskokwim River Fishery.

Study Area

The Tuluksak River is one of several rivers flowing into the lower Kuskokwim River and is located approximately 93 rkm northeast of Bethel, AK. The Tuluksak River is approximately 137 rkm in length and its watershed encompasses roughly 2,098 km² (Tobin 1994; Harper 1997) (Figure 1). It originates in the Kilbuck Mountains and flows to the northwest. The Fog River drains into the lower portion of the Tuluksak River and is the only major tributary. The Tuluksak River is a slow moving river for the majority of its length and is characterized by dense overhanging vegetation and cut banks. The lower portion of the river is characterized by low-gradient, silty substrate and turbid waters. The river section at the weir site, approximately 49 rkm from the mouth, is 42 meters wide, shallowst in the mid-river and deepest near the banks. The substrate contains primarily sand mixed with fine gravel. Water clarity is moderately clear but can become turbid during rainy periods and when boat traffic is present.

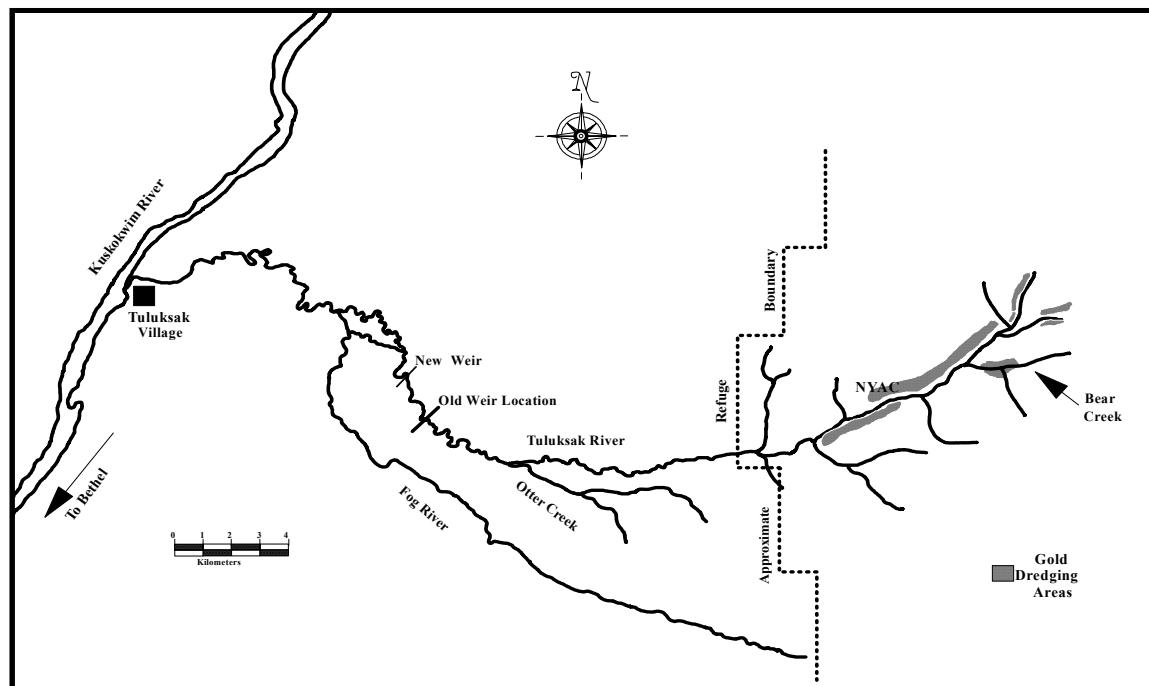


Figure 1.- Tuluksak River drainage on the Yukon Delta National Wildlife Refuge, Alaska.

Methods

Weir Operations

A resistance board weir (Tobin 1994) was installed in the Tuluksak River at rkm 49 ($61^{\circ}02.641'$) ($W160^{\circ}35.049'$). This location is approximately 16 rkm downstream from the previous weir site used between 1991 and 1994 (Harper 1995 a,b,c; Harper 1997). The weir was relocated to position it below all salmon spawning grounds and improve access during low water.

The weir was installed and fish tight by June 10, 2002 and was operated through September 10, 2002. This weir was modified slightly from the previous weir design used between 1991 and 1994 (Tobin 1994). Modifications consisted of: 1) narrowing the panel width to .91 m; 2) removing connector yolks and extending stringers; 3) adding a sixth stringer to the end of the panel where the resistance board is attached; 4) resizing the resistance boards to accommodate the new panel width and replacing wood with .08 cm ($\frac{1}{32}$ inch) aluminum sheeting; 5) replacing the wooden stringers that allow the resistance board to hinge with 2.54 cm (1in) square aluminum tubing; 6) replacing the downstream wooden stringer which is attached to the cable and chain combination with 2.54 cm (1in) square aluminum tubing; 7) re-mapping the cable and chain combination to allow one person to set the resistance board; and 8) outfitting the boat passage panels with .64 cm ($\frac{1}{4}$ in) high density black plastic on the end posterior to the substrate rail.

Two passage panels were installed, one with an attached live trap and the other without. Counts started at approximately 0700 hours every day and continued until visibility was too poor to identify salmon by species. All passing salmon and resident fish were identified to species and recorded. During periods when the weir was submerged, the passage chute and trap were left open to allow salmon and resident fish to pass freely. For those days, salmon escapement was estimated using the average proportion of fish passing in previous years for those individual days (Harper 1995a, b, c; Harper 1997).

A stream gauge was installed near the shore on the river right bank parallel to the weir. The stream gauge, in feet, was read twice daily and noted in the field log. To compensate for the placement of the stream gauge and to have it more accurately reflect the water depth across the river, an average water depth and stream gauge reading were taken simultaneously post installation. Water depth was later converted to metric units. Water temperatures were recorded using an Optic Shuttle Temp® logger. The temperature logger was programmed to record a temperature reading every 30 minutes and was placed in a location not affected by daily fluctuations of surface temperatures. The Temp logger was downloaded once at the end of the season. Temperature data was then averaged for each day.

Biological Data

As in Harper 1997, statistical weeks started on a Sunday and continued through the following Saturday. Sample sizes were 200 chum, 210 chinook, and 170 coho salmon each statistical week. Biological sampling occurred between Monday and Thursday of each statistical week in order to obtain a snapshot sample (Geiger et al. 1990). Once the quota was met for a particular species, sampling would stop for that species and continue for others but would not extend past Thursday.

Age, sex, and length data were collected from each handled chum, chinook, and coho salmon. Sampled fish were caught using the live trap attached to the passage chute. A fyke gate, installed on the entrance of the trap, allowed fish to enter and at the same time minimized the number of fish exiting the trap downstream. Sampling occurred when approximately 40 fish were in the trap. Four scales were extracted from chinook and coho salmon and one was extracted from chum salmon for age determination. All scales were taken from the preferred area using methods described by Koo (1962) and Mosher (1968). Sex was determined by observing external characteristics and length was measured from the mid-eye to the fork of the caudal fin to the nearest 5 millimeters. All data was recorded and then transferred to mark-sense forms at the end of each sample day. Mark-sense forms were processed by the Department when the aging and impression process was completed.

Ages for salmon were reported according to the European Method (Koo 1962) where numerals preceding the decimal denote freshwater annuli and numerals following the decimal denote marine annuli. Total years of life at maturity is determined by adding one year to the sum of the two digits on either side of the decimal of the European designation (i.e. age 1.4 and 2.3 ($1.4=1+4+1=6$ and $2.3=2+3+1=6$) are both six-year-old fish from the same parent year). The parent year is determined by subtracting fish age from the current year.

Age and sex composition for the weekly escapement was expanded directly from the age and sex composition in the weekly sample using a stratified sampling design (Cochran 1977). A two-tailed *t* test ($\alpha = .05$) was used to compare mean lengths of same aged males and females (Zar 1984). Chi-square contingency table analysis was used to test for differences in age composition between the sexes when applicable. Adjustments were made to the test following Rao and Thomas (1989), since the standard test applies to data collected using a simple random sample design and not a stratified sampling design. The X^2 statistic, hereafter referred to as $X^2(\delta)$, was divided by the mean generalized design effect, δ , as a first order correction to the standard test (Rao and Thomas 1989). Estimated design effects for the cells and marginals are presented in the results. Age and sex specific escapements in a stratum, A_{hij} , and their variances, $V[A_{hij}]$, were estimated as:

$$A_{hij} = N_h P_{hij};$$

and

$$V[A_{hij}] = N_h^2 \left(1 - n_h/N_h \right) \left(P_{hij}(1 - P_{hij})/n_h - 1 \right)$$

where

N_h = total escapement of a given species during stratum h

P_{hij} = estimated proportion of age i and sex j fish, of a given species, in the stratum h ; and

n_h = total number of fish, of a given species, in the sample for stratum h .

Abundance estimates and their variances for each stratum were summed to obtain age- and sex-specific escapements for the season as follows:

$$A_{ij} = \sum A_{hij};$$

and

$$V[A_{ij}] = \sum V(A_{hij});$$

where

A_{ij} = estimated total escapement for age i and sex j fish of a given species.

Days with partial counts were considered incomplete and were reported as zero counts. Estimates were calculated for these dates and were based on the average daily proportion of passage from previous years data. An average of the daily proportions for previous years data is calculated since daily escapement can vary between years. The sum of the averaged daily proportions, calculated for days with zero counts, is the estimated total escapement missed. The total escapement is the sum of the observed counts during 2001 divided by one minus the proportion missed. Estimates were calculated in 1994 between August 26 and September 1 and between September 9 and 10 (Harper 1997). These estimated counts were not used when calculating the 2001 estimates.

Results

Weir Operations

Average water depth during 2002 was 0.51 meters. Water depth during 2002 steadily decreased after installation to 0.29 meters by August 5 before rising to a maximum depth of 1.05 meters on September 9 (Figure 2; Appendix 1). Water temperatures averaged 12.1°C and ranged from 15.6°C on August 5 to 8.3°C on September 9 (Figure 2). No damage occurred to the weir during the 2002 field season.

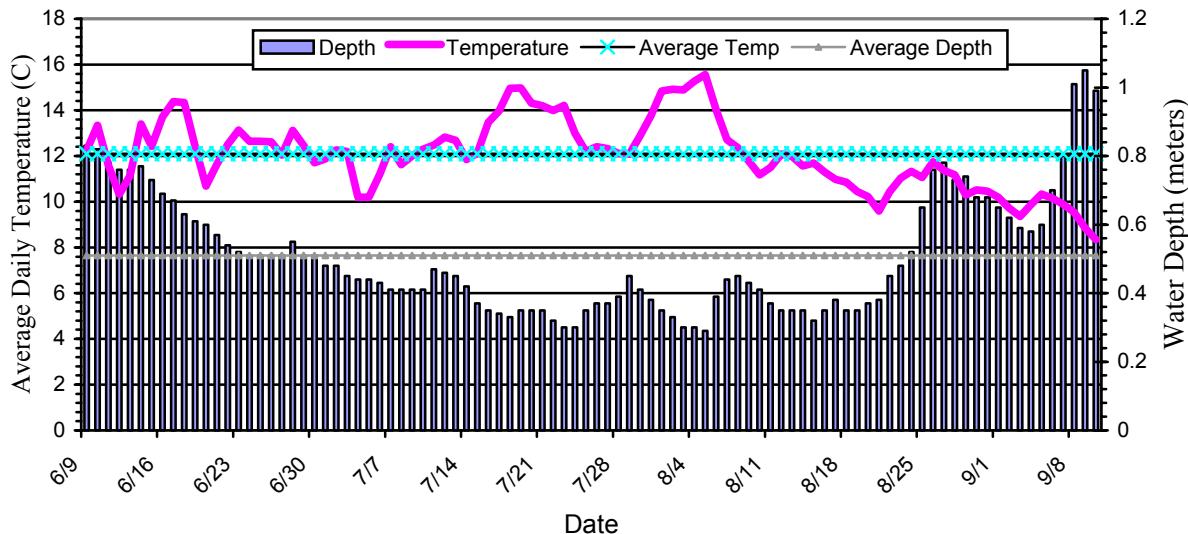


Figure 2.- Average daily water temperatures and average daily water depths in the Tuluksak River, 2002.

Biological Data

A total of 9,958 chum, 1,346 chinook, 82 sockeye, 27 pink, and 11,487 coho salmon were counted through the Tuluksak River weir during 2002 (Appendix 2). Resident fish passing the weir included two char, seven white fish, and five grayling.

Chum Salmon

Peak weekly passage ($N=3,301$) for chum salmon was between July 14 and July 20 (Figure 3). During this time period 33% of the chum salmon passed the weir. The observed median cumulative passage date occurred on July 18 (Appendix 3). Gill net marks ($N=723$) were observed on 7% of the chum salmon passing the weir.

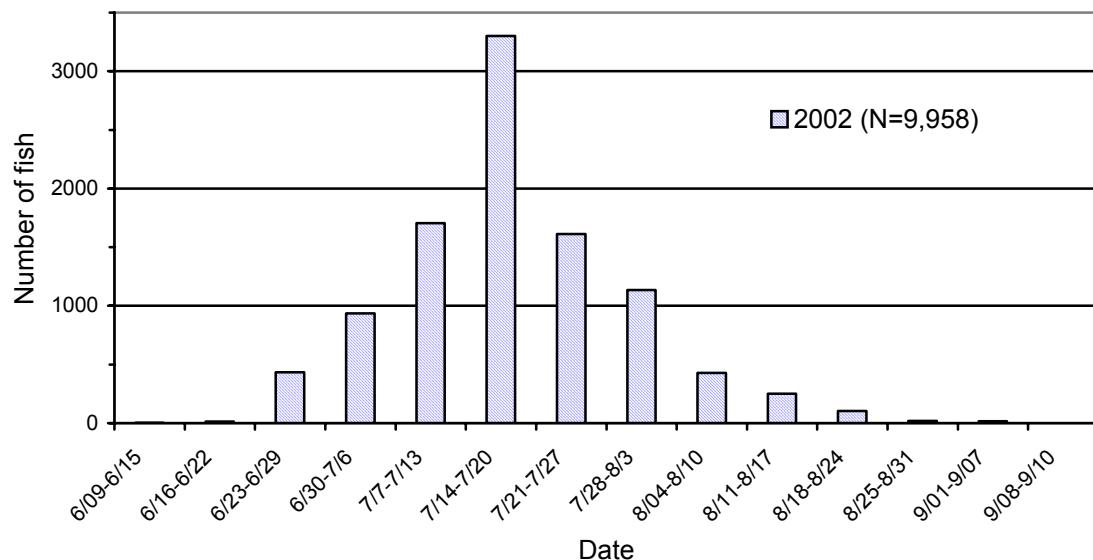


Figure 3.- Weekly escapement of chum salmon through the Tuluksak River weir during 2002.

Four age groups, 0.2, 0.3, 0.4, and 0.5, were identified from 928 of 1,057 chum salmon sampled from the weir escapement. Age 0.3 chum salmon were the most abundant, accounting for 53% of the aged sample (Table 1; Appendix 4). Age 0.4 (36%), 0.2 (10%), and 0.5 (<.01%) fish comprised the balance of the sample (Appendix 4). Females made up an estimated 44% of the total chum salmon escapement. There was a significant difference in age composition between sexes ($P<.05$).

Table 1.- Length-at-age for chum salmon sampled from the Tuluksak River weir, 2002.

Sex	Age	N	<u>Mid-eye to fork length (mm)</u>	
			Mean	Range
Male	0.2	44	527	440-590
	0.3	247	576	450-680
	0.4	206	591	485-710
	0.5	5	600	520-650
Total		502		
Female	0.2	47	493	400-590
	0.3	247	542	450-625
	0.4	131	559	480-660
	0.5	1	550	-
Total		426		

The dominant sex shifted from males to females late in the run (Figure 4; Appendix 4). In sampled fish, male chum salmon were significantly larger than female chum salmon for ages 0.2, 0.3 and 0.4 fish (*t*-test: age 0.2, $t=4.969$, $df=84$, $P<.001$; age 0.3, $t=10.86$, $df=485$, $P<.001$; age 0.4, $t=8.024$, $df=295$, $P<.001$, age 0.5, insufficient data).

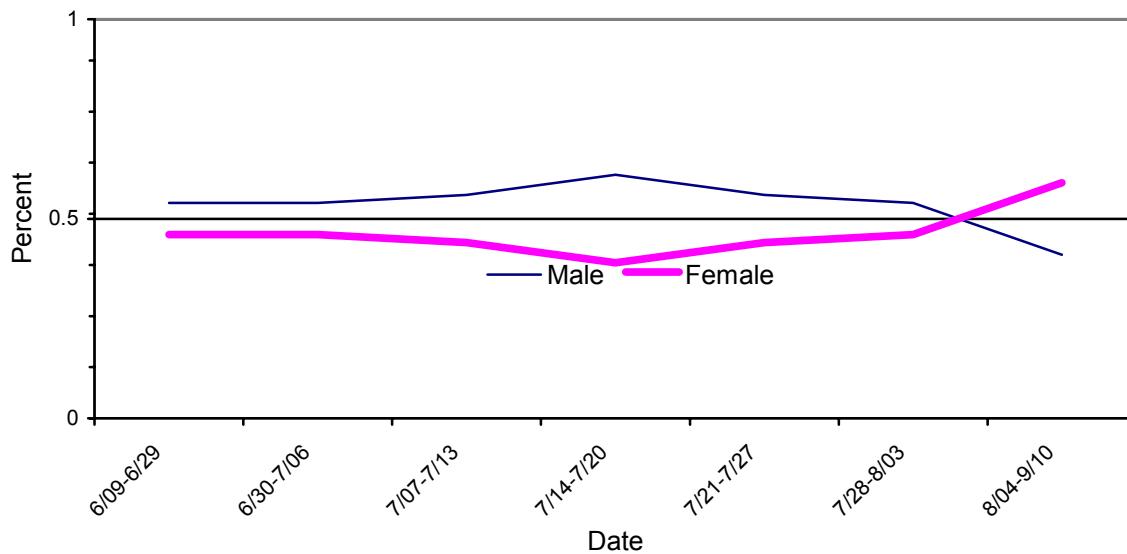


Figure 4.- Estimated sex composition of chum salmon over time, Tuluksak River, 2002.

Chum salmon carcasses were first recorded on June 26, 2002 (Figure 5; Appendix 11). Median passage dates for escaping chum salmon and chum salmon carcasses washing onto the upstream side of the weir were separated by 12 days. By September 10, 2002, when the weir was removed, 2,135 chum carcasses were passed over the weir.

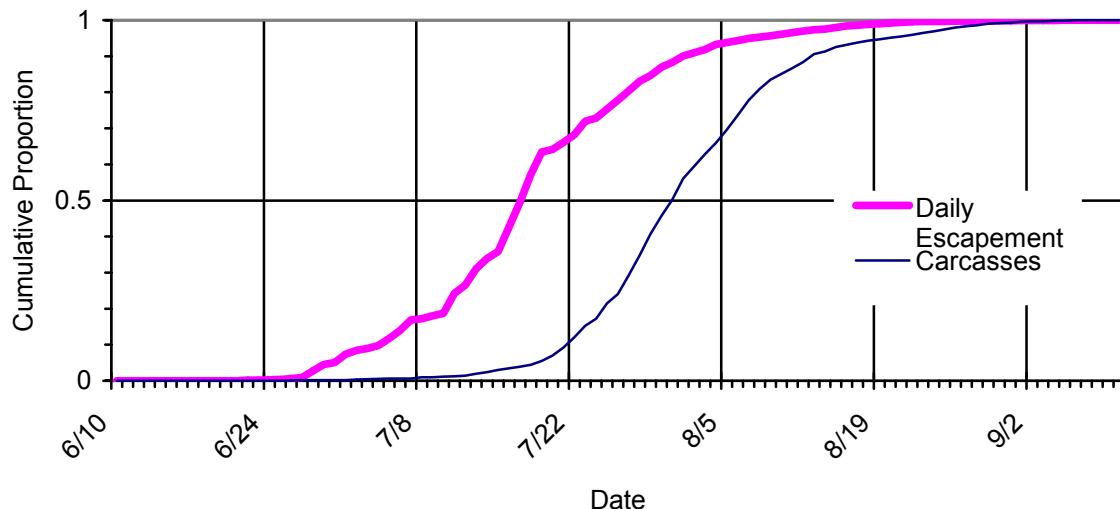


Figure 5.- Cumulative proportion of daily chum salmon passage and chum salmon carcasses washing onto the upstream side of Tuluksak River weir, 2002.

Chinook Salmon

Peak weekly passage occurred between July 7 and July 13 (N=403). The median cumulative percent passage date occurred on July 11 (Figure 6; Appendix 5). Of the 1,346 chinook salmon passing the weir, 103 (8%) were observed with gill net marks (Appendix 2).

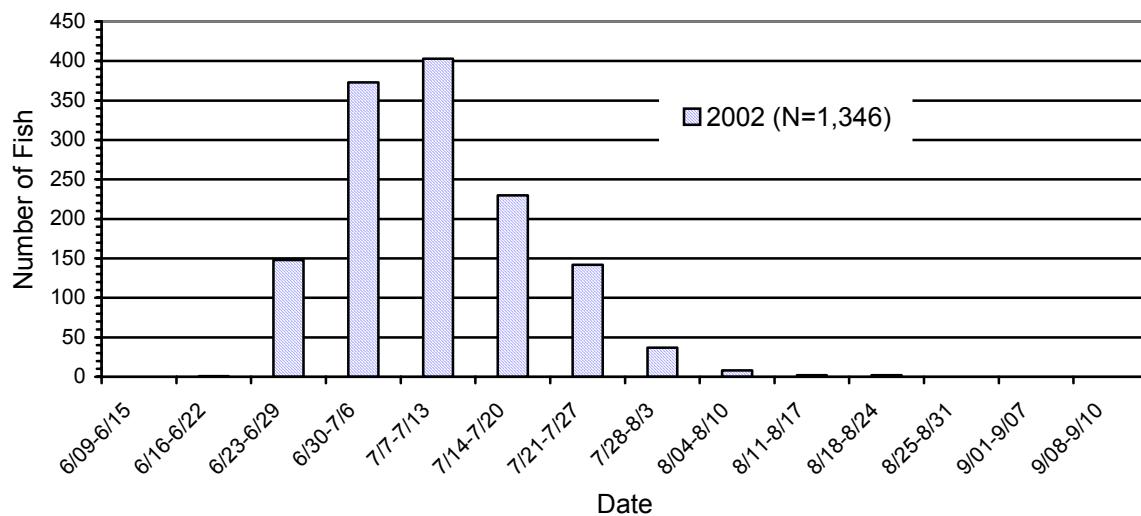


Figure 6.- Weekly escapement of chinook salmon through the Tuluksak River weir during 2002.

Age, sex and length data were collected from 192 chinook between June 10 and September 10, 2002 (Table 2). Six age classes were identified from the sample and age 1.2 accounted for 37% of the chinook salmon escapement (Appendix 6). The balance of the sample was comprised of age 1.3 (30%), 1.4 (28%), 1.5 (2%), 1.1 (2%), and 2.2 (1%) fish (Appendix 6). Females made up an estimated 24% of the total chinook salmon escapement.

In sampled fish, mean lengths of female chinook salmon were larger than male chinook salmon for age 1.4 fish (*t*-test: age 1.3, $t=2.153$, $df=9$, $P>.05$; age 1.4, $t=2.621$, $df=27$, $P<.05$, age 1.2, 1.5 and 2.2, insufficient data). There was a significant difference in the age composition between sexes ($P<.05$).

Chinook salmon carcasses ($N=110$) were observed on the weir starting July 09, 2002 (Appendix 11). This was approximately 17 days after the first chinook salmon was counted through the weir (Figure 7). The median passage dates for daily escapement and carcasses were separated by 27 days.

Table 2.- Length-at-age for chinook salmon sampled from the Tuluksak River weir, 2002.

Sex	Age	N	<u>Mid-eye to fork length (mm)</u>	
			Mean	Range
Male	1.1	2	435	-
	1.2	60	539	445-615
	1.3	54	664	550-770
	1.4	20	796	655-970
	1.5	1	915	-
Total		137		
Female	2.2	1	585	-
	1.3	9	724	600-850
	1.4	39	846	720-940
	1.5	6	893	840-970
Total		55		

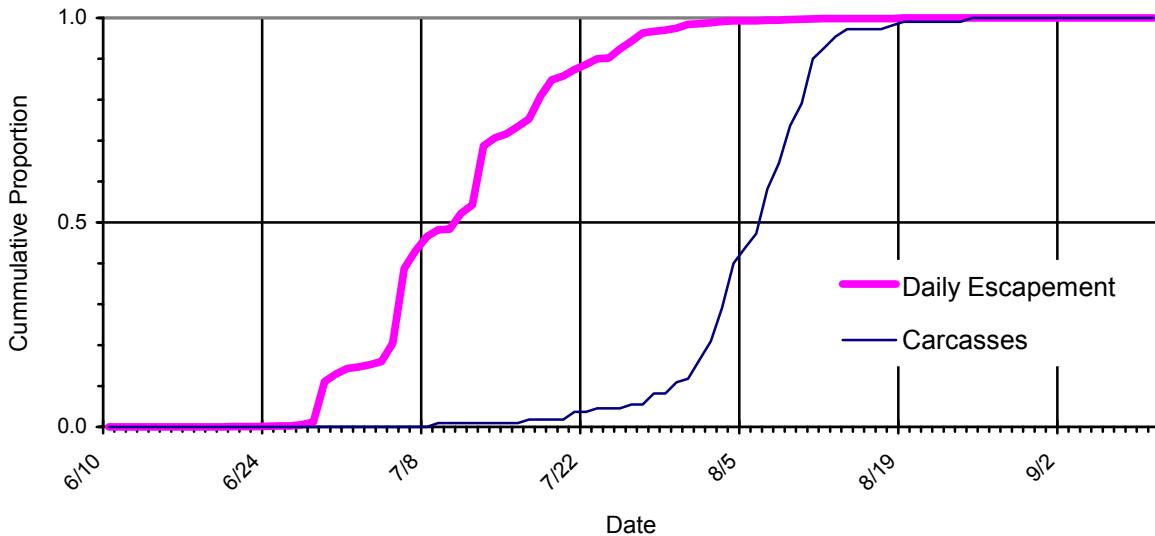


Figure 7.- Cumulative proportion of daily chinook salmon passage and carcasses washing onto the upstream side of the Tuluksak River weir, 2002.

Sockeye

Sockeye salmon ($N=82$) passed the weir between June 26 and August 21, 2002. Two peak weekly passage periods occurred between June 30 and July 6 ($N=28$) and July 14 and July 20 ($N=28$), with a median cumulative percent passage date of July 14 (Appendix 7). Ten sockeye salmon were sampled during the 2002 weir escapement project.

Fifteen sockeye salmon carcasses were counted on the upstream side of the weir during 2002. The first carcass washed onto the weir on July 19, 23 days after the first sockeye was counted through the weir (Appendix 7; Appendix 11).

Pink Salmon

Pink salmon started to pass the weir on July 2 ($N=27$) and periodically passed in small numbers until September 8, 2002. Peak weekly passage of five pink salmon was observed between August 25 and August 31 (Appendix 8). The median cumulative percent passage date was August 17.

The first pink salmon carcass washed onto the weir on July 4, two days after the first pink salmon was counted through the weir (Appendix 11). Twenty-four pink salmon carcasses were counted on the weir during operations, which accounted for 89% of the pink salmon counted through the weir.

Coho Salmon

The first coho salmon was counted on July 29 ($N=2$). The run steadily increased to 11,487 by September 10, which marked the last day of weir operations. Peak weekly passage ($N=5,014$) was between September 1 and September 7 with the daily peak passage ($N=2,409$) occurring on September 5 (Figure 8). The median passage date was August 29 (Appendix 9). Gillnet marks ($N=307$) were observed on 3% of the coho salmon passing the weir (Appendix 2).

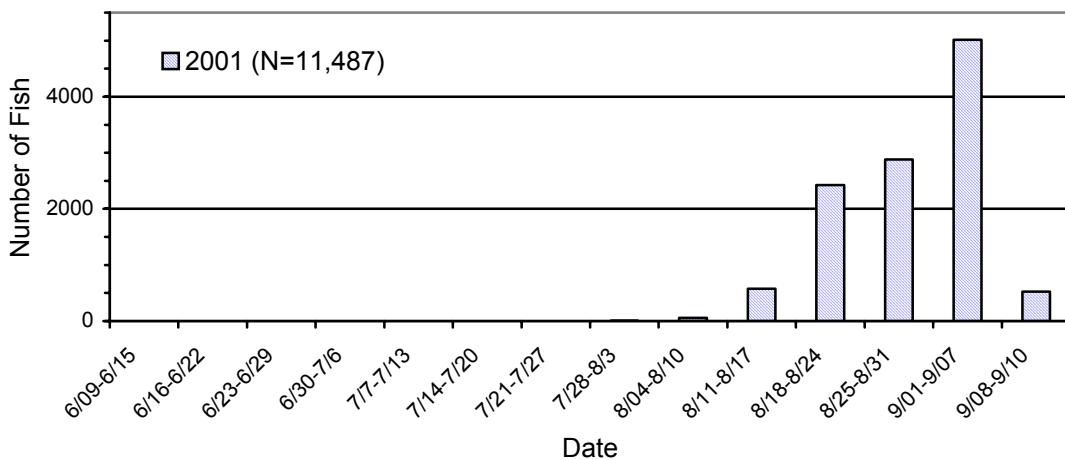


Figure 8.- Weekly escapement of coho salmon passing the Tuluksak River weir during 2002.

Three age classes were identified from 485 aged coho salmon. The majority (86%) of the coho salmon were age 2.1 fish (Table 3). The remaining sample was comprised of 3.1 (14%) and 1.1 (<1%) fish. It is estimated that females comprised 58% of the coho salmon escapement (Appendix 10).

There was no significant difference in the age composition between sexes ($P>.05$) in the sample. In the sample, mean lengths for male and female age 2.1 and 3.1 coho salmon were different (age 1.1, insufficient data; age 2.1, $t=7.36$, $df=324$, $P<.05$; age 3.1, $t=3.04$, $df=38$, $P<.05$).

Table 3.- Length-at-age for coho salmon sampled from the Tuluksak River weir, 2002.

Sex	Age	N	Mid-eye to fork length (mm)	
			Mean	Range
Male	1.1	1	510	-
	2.1	206	538	409-660
	3.1	27	531	380-640
	Total	234		
Female	1.1	2	560	-
	2.1	209	568	460-660
	3.1	40	567	470-620
	Total	251		

Eight coho salmon carcasses were observed on the weir with the first fish appearing on August 20 (Appendix 11).

Resident Species

Resident species were recorded passing the weir and consisted of two Dolly Varden, seven whitefish, and five grayling. Although resident species were able to pass freely through the pickets, passage through the passage chutes was recorded throughout the entire season (Appendix 2). A total of two whitefish carcasses and one grayling carcass were recorded on the upstream side of the weir.

Discussion

Weir Operations

The weir was installed by June 10, 2002 and operated through September 10, 2002. This was the earliest installation for the Tuluksak River weir. Moderate water depths in early June and leaving the substrate rail in-river after the 2001 field season facilitated an early installation. The weir was operational throughout the entire 2002 field season.

Water depths were low during the majority of the field season especially during peak chum and chinook salmon run-times. Water levels affected fish passage when less than or equal to 0.47 m. This problem was addressed by fabricating an 80-foot jetty using weir panels and plywood. The jetty was attached on the upstream side of the trap to deflect water into the trap. The jetty raised the water depth approximately six inches in the trap, which increased fish passage.

The weir was removed on September 11, 2002 and the substrate rail was left in place to expedite installation in 2003. The rail was totally covered by silt, sand, and gravel with little to no scouring. The rail was also covered with sand bags to minimize scouring during winter and spring.

Biological Data

Average to below average water levels yielded complete fish counts throughout the entire 2002 field season. When averaging all recorded data from the Tuluksak River, coho salmon counts were highest on record whereas chum, chinook, sockeye, and pink salmon counts were all below average.

Chum Salmon

The observed chum salmon escapement in 2002 ($N=9,958$) was the second lowest recorded return to the Tuluksak River with 1991 being the lowest ($N=7,675$) (Figure 9; Appendix 3) (Harper 1995a, b, c). The 2002 escapement was 43% lower than the observed escapement in 2001 ($N=17,599$), which is the largest chum salmon escapement on record for Tuluksak River.

The majority of the 2001 chum salmon escaping to the Tuluksak River were four-year-old fish from the 1997 brood year (Gates et. al. 2002). Four-year-old fish were also the dominant age class in 2002, but they comprised 25% less of the 2002 run. The difference was due to a 17% increase of five-year-old fish and 7% increase of three-year-old fish in 2002. Due to the larger percentage of 0.2 fish returning in 2002, we can expect to see a large return of 0.3 chum salmon in 2003.

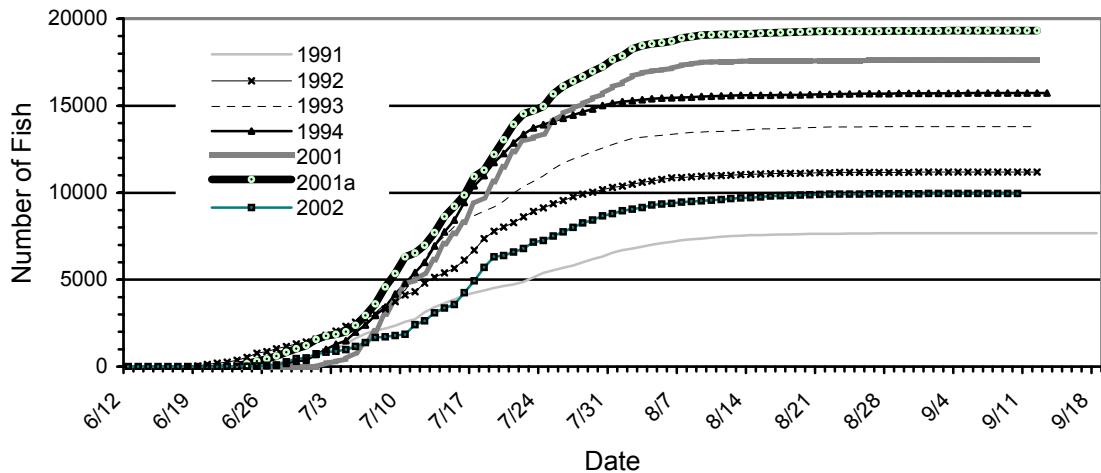


Figure 9.- Cumulative daily counts of chum salmon counted through the Tuluksak River weir during 1991, 1992, 1993, 1994, 2001, and 2002, where 2001a represents the cumulative estimated daily escapement for periods prior to weir installation and during high water.

Chinook Salmon

The chinook salmon count during 2002 ($N=1,346$) was complete and is the third largest escapement on record. The 2002 chinook salmon escapement was below average when compared to the six year average ($N=1,506$). Run timing in 2002 was similar to previous years data. Median passage dates for chinook for all six years of weir operations are between July 10 and July 14. The median passage date during 2002 was July 11, the same date as in 1993. The earliest median passage date was July 10, 1991 and the latest was July 14, 2001 (Figure 10, Appendix5).

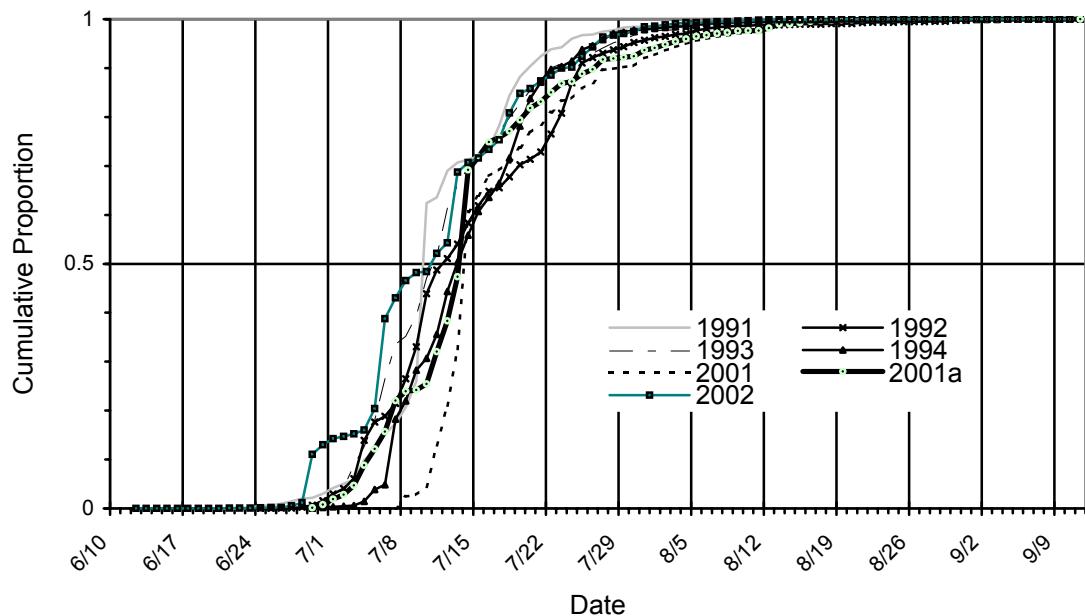


Figure 10.- Cumulative proportion of chinook salmon escaping the Tuluksak River weir during 1991, 1992, 1993, 1994, 2001, and 2002 where 2001a represents the cumulative estimated daily escapement.

In the past, Tuluksak River chinook salmon returns were comprised of 10 age classes between 1991 and 1994. Chinook salmon ages varied from three-year-old fish to eight-year-old fish (Harper 1995 a,b,c; Harper 1997). Sample sizes during those years ranged from 347 to 618 individuals. During each year, age compositions of males and females differed, but males were generally comprised of 7-9 age classes and females 4-6. From the 2002 sample, male chinook salmon were comprised of five age classes whereas female chinook salmon were comprised of four age classes. Out of the six age classes, age 1.2, 1.3 and 1.4 fish comprised 95% of the sample. The low sample size during 2002, relative to previously collected data, could have resulted in the fewer number of identified age classes. In addition, according to ADF&G Commercial Fishing Division, 97.5% of chinook salmon under 719 mm returning to the Kuskokwim River are male chinook salmon (Linderman et.al., In-Prep.) Therefore, based on length, with the exception of the one female less than 719 mm we feel that we have a good representation of the chinook salmon escapement.

Escapement goals have not been established for the Tuluksak River chinook salmon population. However, managers have recently restricted subsistence fishing to four days per week. This restriction should allow additional females to escape into the river to spawn. It is thought that female chinook salmon that comprise small stocks such as those in the Tuluksak River may be heavily impacted by the use of large mesh nets in the Kuskokwim River. Given Tuluksak River's low abundance of chinook salmon, future management actions should consider these small populations in order to conserve them and allow for successful recruitment to the population.

Sockeye Salmon

The total number of sockeye salmon passing the Tuluksak River weir has been consistently small ($N < 150$) (Appendix 7). The sockeye salmon escapement in 2002 ($N=82$) was below average when averaging escapements from all six-years of data (Appendix 7). Fifty-four percent had passed by July 14, which is the earliest median passage date on record for sockeye salmon in the Tuluksak River. Median passage dates between 1991 and 1993, and 2001 occurred between July 20 and 25 with 1994 falling on August 1. Currently, sockeye are not actively managed in Districts W-1 and W-2 (Burkey et al. 2000). Given the low number of sockeye salmon returning to the Tuluksak River, over-fishing because of by-catch could be detrimental to this small population of fish.

Pink Salmon

Kuskokwim River pink salmon have strong even-year runs (Francisco et al. 1992). This was observed between 1991 and 1994 where even years averaged 2,979 and odd years averaged 301 individuals (Appendix 8). Commercial catches have averaged 3,948 during even years in the Kuskokwim River since 1980 (Franscisco et al. 1992). The 2002 pink salmon escapement was ($N=27$) considerably lower than 1992 ($N=2,470$) and 1994 ($N=3487$) escapements. This low number is probably a result of wider picket spacing used in the current weir design. The August 18 median passage date is the latest on record and is probably a good indication that pink salmon were escaping through the pickets (Appendix 7). Although the wider picket spacing may have resulted in fewer fish

counted, pink salmon returns have steadily decreased in recent years throughout the entire Kuskokwim River watershed.

No scales were taken from pink salmon during 2002 but several age 1.1 fish were identified from scales taken in 1994 (Harper 1997). This age has been found in other pink salmon populations (Heard 1991). Currently, no escapement goals have been established in the Kuskokwim River drainage and very little information is known about the Kuskokwim River drainage pink salmon stocks.

Coho Salmon

Run timing in 2002 was similar to the run timing observed during all years of weir operations with the exception of 1991 (Figure 11). The first coho salmon in 2002 was counted on July 29, whereas in 1992, 1993, 1994 and 2001(a) was between July 23 and 28. Run timing occurred a week later in 1991 (August 4). The median passage date for coho salmon in 2002 was August 29. This is very similar to previously recorded median passage dates with the exception of 1991. The median passage date in 1991 occurred on September 4, one week late (Figure 11; Appendix 9).

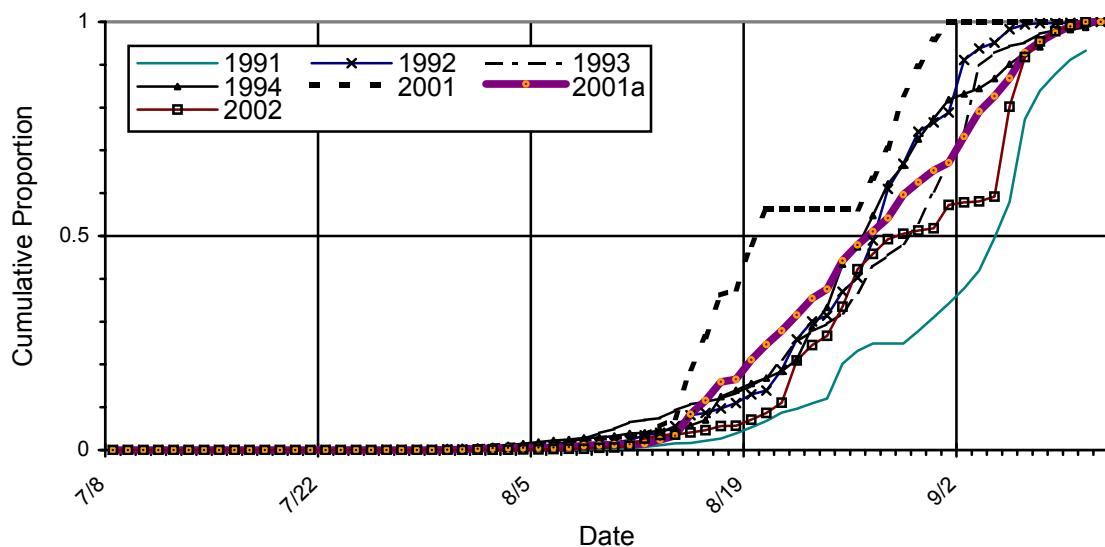


Figure 11.- Cumulative proportion of coho salmon passing the Tuluksak River weir during 1991, 1992, 1993, 1994, 2001, and 2002 where 2001a includes estimates for uncensused days.

Salmon escapement in the Tuluksak River was below average in 2002 based on previously recorded data. Given the recent low Kuskokwim River salmon returns, a conservative management strategy should be adopted which may necessitate continued restrictions to assure that adequate fish numbers reach spawning grounds. Furthermore, projects involving the enumeration of these salmon stocks should continue in order to provide managers with accurate and timely data on the area fishery.

Recommendations For 2003

- Install a second live trap to facilitate larger sample sizes
- Increase sampling efforts to meet the minimum sample required for statistical analysis
- Modify bulkhead height to increase operational range during high water events
- Develop better standard operating procedures (SOPs) on sampling techniques and invest more time in training weir staff
- Improve weir cleaning techniques

References

- Alaska Department of Fish and Game Division of Commercial Fisheries News Release. 2001. Preliminary 2001 Kuskokwim Area Salmon Fishery Summary. Alaska Department of Fish and Game. Bethel, Alaska.
- Burkey, C., M. Coffing, J. Menard, D. Molyneaux, C. Utermohle, T. Vania. January 1999. Annual management report for the subsistence and commercial fisheries of the Kuskokwim Area, 1997. Alaska Department of Fish and Game, Division of Commercial Fisheries of the Kuskokwim Area, Regional Information Report¹ No. 3A99-12, Anchorage, Alaska.
- Burkey, C., M. Coffing, J. Menard, D. Molyneaux, P. Salomone, C. Utermohle, T. Vania. November 1999. Annual management report for the subsistence and commercial fisheries of the Kuskokwim Area, 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries of the Kuskokwim Area, Regional Information Report¹ No. 3A99-36, Anchorage, Alaska.
- Burkey, C., M. Coffing, J. Menard, D. Molyneaux, P. Salomone, C. Utermohle. November 2001. Annual management report for the subsistence and commercial fisheries of the Kuskokwim Area, 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries of the Kuskokwim Area, Regional Information Report¹ No. 3A01-34, Anchorage, Alaska.
- Cochran, W.G. 1977. Sampling techniques, 3rd edition. John Wiley and Sons, New York.
- Francisco, K.R., C. Anderson, C. Burkey, M. Coffing, K. Hyer, D. Molyneaux, and C. Utermohle. 1992. Annual management report for the subsistence and commercial fishery of the Kuskokwim Area, 1991. Alaska Department of Fish and Game, Division of Commercial Fisheries, AYK Region, Regional Information Report 3A92-06, Anchorage, Alaska.
- Gates, K.S., and K.C. Harper. 2002. Run Timing and Abundance of Adult Pacific Salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 2001. U.S. Fish and Wildlife Service, Kenai Fish and Wildlife Field Office. Alaska Fisheries Data Series Number 2002-6, Kenai, Alaska.
- Geiger, J.H., J.E. Clark., B. Cross, and S. McPherson. 1990. Report from the work group on sampling. Pages 3-12 in H.J. Geiger, and R.L. Wilbur, editors. Proceedings of the 1990 Alaska stock separation workshop. Alaska Department of Fish and Game, Division of Commercial Fisheries, Special Fisheries Report No. 2, Juneau, Alaska.
- Harper, K.C. 1995a. Run timing and abundance of adult salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 1991. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Fisheries Progress Report, 95-1, Kenai, Alaska.

- Harper, K.C. 1995b. Run timing and abundance of adult salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 1992. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Fisheries Progress Report, 95-3, Kenai, Alaska.
- Harper, K.C. 1995c. Run timing and abundance of adult salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 1993. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Fisheries Progress Report, 95-2, Kenai, Alaska.
- Harper, K.C. 1997. Run timing and abundance of adult salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 1994. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Fisheries Technical Report 41, Anchorage, Alaska.
- Heard, William. 1991. Life history of pink salmon. Pages 121-230 in C. Groot and L. Margolis, editors. Pacific Salmon Life Histories. Department of Fisheries and Oceans, Biological Sciences Branch. University of British Columbia Press. Vancouver, British Columbia.
- Koo, T.S.Y. 1962. Age determination in salmon. Pages 37-48 in T.S.Y. Koo, editor. Studies of Alaskan red salmon. University of Washington Press, Seattle, Washington.
- Linderman, J.C. Jr, D.B. Molyneaux, L. DuBois, W. Morgan. In Preparation. George River weir salmon studies and aerial surveys. 1996-2002. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Anchorage, Alaska.
- Mosher, K.H. 1968. Photographic atlas of sockeye salmon scales. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Fishery Bulletin No. 2: 243-274.
- Rao, J.N.K., and D.R. Thomas. 1989. Chi-squared tests for contingency tables. Pages 89-114 in Skinner, C.J., D. Holt, and T.M.F. Smith, editors. Analysis of complex surveys. John Wiley & Sons, New York.
- Tobin, J.H. 1994. Construction and performance of a portable resistance board weir for counting migrating adult salmon in rivers. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office. Alaska Fisheries Technical Report Number 22. Kenai, Alaska.
- U.S. Fish and Wildlife Service. 1992. Fishery management plan for the Yukon Delta National Wildlife Refuge. U.S. Fish and Wildlife Service, Anchorage, Alaska.
- Zar, J.H. 1984. Biostatistical analysis, second edition. Prentice and Hall, Englewood Cliffs, New Jersey.

Appendix 1.- Average daily water temperatures and depth in the Tuluksak River, 2002.

Date	Average Daily Temperature (°C)	Water Depth (M)	Date	Average Daily Temperature (°C)	Water Depth (M)
6/9	12.24	0.83	7/26	12.41	0.37
6/10	13.34	0.82	7/27	12.32	0.37
6/11	11.59	0.78	7/28	12.11	0.39
6/12	10.32	0.76	7/29	12.08	0.45
6/13	11.15	0.76	7/30	12.89	0.41
6/14	13.40	0.77	7/31	13.77	0.38
6/15	12.42	0.73	8/1	14.84	0.35
6/16	13.71	0.69	8/2	14.92	0.33
6/17	14.38	0.67	8/3	14.89	0.30
6/18	14.33	0.63	8/4	15.27	0.30
6/19	12.42	0.61	8/5	15.57	0.29
6/20	10.68	0.60	8/6	14.03	0.39
6/21	11.64	0.57	8/7	12.72	0.44
6/22	12.51	0.54	8/8	12.36	0.45
6/23	13.13	0.52	8/9	11.78	0.43
6/24	12.64	0.51	8/10	11.17	0.41
6/25	12.64	0.51	8/11	11.49	0.37
6/26	12.61	0.51	8/12	12.08	0.35
6/27	12.04	0.51	8/13	11.99	0.35
6/28	13.12	0.55	8/14	11.57	0.35
6/29	12.46	0.51	8/15	11.69	0.32
6/30	11.71	0.51	8/16	11.30	0.35
7/1	11.88	0.48	8/17	10.98	0.38
7/2	12.27	0.48	8/18	10.85	0.35
7/3	12.19	0.45	8/19	10.45	0.35
7/4	10.20	0.44	8/20	10.23	0.37
7/5	10.19	0.44	8/21	9.60	0.38
7/6	11.20	0.43	8/22	10.45	0.45
7/7	12.40	0.41	8/23	11.04	0.48
7/8	11.62	0.41	8/24	11.33	0.52
7/9	12.00	0.41	8/25	11.06	0.65
7/10	12.29	0.41	8/26	11.75	0.76
7/11	12.47	0.47	8/27	11.37	0.78
7/12	12.83	0.46	8/28	11.17	0.73
7/13	12.69	0.45	8/29	10.29	0.74
7/14	11.84	0.42	8/30	10.52	0.68
7/15	12.12	0.37	8/31	10.46	0.68
7/16	13.47	0.35	9/1	10.20	0.65
7/17	13.97	0.34	9/2	9.72	0.62
7/18	14.97	0.33	9/3	9.35	0.59
7/19	14.98	0.35	9/4	9.88	0.58
7/20	14.31	0.35	9/5	10.34	0.60
7/21	14.20	0.35	9/6	10.15	0.70
7/22	13.98	0.32	9/7	9.89	0.80
7/23	14.21	0.30	9/8	9.54	1.01
7/24	13.00	0.30	9/9	8.85	1.05
7/26	12.20	0.35	9/10	8.35	0.99

Appendix 2. Daily escapement of salmon and resident species at the Tuluksak River weir, 2002.

Date	Total Daily Salmon Escapement					Gill Net Marks					Resident Species			
	Chum Salmon	Chinook Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Chinook Salmon	Chum Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Dolly Varden	Whitefish	Arctic Grayling	Northern Pike
6/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/14	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6/15	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/21	0	1	0	0	0	1	0	0	0	0	0	0	0	0
6/22	15	0	0	0	0	0	2	0	0	0	0	0	0	0
6/23	0	0	0	0	0	0	0	0	0	0	0	1	0	0
6/24	10	1	0	0	0	0	2	0	0	0	0	0	0	0
6/25	8	1	0	0	0	0	1	0	0	0	1	0	0	0
6/26	30	0	1	0	0	0	7	0	0	0	0	1	0	0
6/27	22	4	2	0	0	1	7	1	0	0	0	0	0	0
6/28	191	9	0	0	0	1	12	0	0	0	0	0	0	0
6/29	173	133	0	0	0	8	9	0	0	0	0	0	0	0
6/30	54	26	0	0	0	2	4	0	0	0	0	1	0	0
7/1	230	17	1	0	0	0	12	0	0	0	0	0	0	0
7/2	102	6	0	1	0	1	11	0	0	0	0	0	0	0
7/3	51	7	0	2	0	0	9	0	0	0	0	0	0	0
7/4	80	11	0	0	0	1	10	0	0	0	0	0	1	0
7/5	198	59	12	1	0	2	11	0	0	0	0	1	0	0
7/6	220	247	15	0	0	5	16	0	0	0	1	0	0	0
7/7	295	57	6	0	0	0	0	0	0	0	0	0	0	0
7/8	30	48	0	1	0	3	1	0	0	0	0	0	0	0
7/9	79	22	1	0	0	1	1	0	0	0	0	0	0	0
7/10	75	2	1	0	0	0	0	0	0	0	0	0	0	0

-continue-

Appendix 2. (Continued)

Date	Total Daily Salmon Escapement					Gill Net Marks					Resident Species			
	Chum Salmon	Chinook Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Chinook Salmon	Chum Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Dolly Varden	Whitefish	Arctic Grayling	Northern Pike
7/11	545	51	0	0	0	3	21	0	0	0	0	0	0	0
7/12	230	29	0	0	0	0	26	0	0	0	0	0	0	0
7/13	451	194	0	1	0	23	44	0	0	0	0	0	0	0
7/14	284	27	6	0	0	0	20	0	0	0	0	0	0	0
7/15	196	12	3	1	0	0	26	1	0	0	0	0	0	0
7/16	675	24	4	0	0	1	76	0	0	0	0	0	0	0
7/17	686	26	5	1	0	3	18	0	0	0	0	0	0	0
7/18	764	74	8	0	0	11	70	1	0	0	0	0	0	0
7/19	620	54	2	0	0	3	50	1	0	0	0	0	0	0
7/20	76	13	0	2	0	0	8	0	0	0	0	0	0	0
7/21	191	21	0	0	0	0	9	0	0	0	0	0	0	0
7/22	210	16	1	0	0	1	14	0	0	0	0	0	0	0
7/23	370	19	0	0	0	4	31	0	0	0	0	0	0	0
7/24	87	3	0	0	0	0	10	0	0	0	0	0	0	0
7/25	249	30	0	1	0	1	14	0	0	0	0	0	0	0
7/26	254	25	1	1	0	7	12	0	0	0	0	0	0	0
7/27	252	28	1	0	0	8	20	0	0	0	0	0	0	0
7/28	264	5	0	0	0	0	17	0	0	0	0	0	0	0
7/29	161	4	2	0	2	1	11	0	0	0	0	0	0	0
7/30	228	6	2	0	2	1	7	0	0	0	0	0	0	0
7/31	135	13	0	0	0	5	13	0	0	0	0	0	0	0
8/1	172	2	0	0	1	1	10	0	0	0	0	0	0	0
8/2	88	3	0	0	0	0	5	0	0	0	0	0	0	0
8/3	88	4	0	1	3	1	8	0	0	0	0	0	0	0
8/4	142	2	0	0	8	1	15	0	0	0	0	0	0	0
8/5	58	0	0	0	2	0	4	0	0	0	0	0	0	0
8/6	51	1	0	0	6	0	3	0	0	0	0	0	0	0
8/7	58	2	0	0	7	0	3	0	0	0	0	0	0	0
8/8	39	0	0	0	6	0	6	0	0	0	0	0	0	0
8/9	39	2	0	0	19	1	10	0	0	2	0	1	0	0
8/10	41	1	2	0	9	0	5	0	0	0	0	0	0	0
8/11	42	1	1	0	46	0	5	0	0	0	0	0	0	0

-continue-

Appendix 2. (Continued)

Date	Total Daily Salmon Escapement					Gill Net Marks					Resident Species			
	Chum Salmon	Chinook Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Chinook Salmon	Chum Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Dolly Varden	Whitefish	Arctic Grayling	Northern Pike
8/12	47	1	2	0	197	0	2	0	0	4	0	0	0	0
8/13	35	0	0	0	94	0	2	0	0	0	0	0	0	0
8/14	19	0	0	0	8	0	2	0	0	0	0	0	0	0
8/15	39	0	1	0	61	0	2	0	0	2	0	0	0	0
8/16	50	0	0	0	66	0	2	0	0	0	0	0	1	0
8/17	18	0	0	1	103	0	0	0	0	1	0	0	0	0
8/18	23	0	0	0	14	0	1	0	0	0	0	0	1	0
8/19	21	2	0	0	160	1	0	0	0	7	0	0	1	0
8/20	17	0	0	0	183	0	1	0	0	3	0	0	1	0
8/21	14	0	2	0	275	0	0	0	0	9	0	0	0	0
8/22	16	0	0	0	1,131	0	2	0	0	32	0	0	0	0
8/23	9	0	0	0	415	0	0	0	0	6	0	0	0	0
8/24	3	0	0	0	248	0	0	0	0	3	0	0	0	0
8/25	4	0	0	0	777	0	0	0	0	11	0	0	0	0
8/26	2	0	0	0	1,011	0	0	0	0	27	0	0	0	0
8/27	3	0	0	0	406	0	0	0	0	19	0	0	0	0
8/28	0	0	0	1	401	0	0	0	0	19	0	0	0	0
8/29	1	0	0	0	139	0	0	0	0	1	0	0	0	0
8/30	8	0	0	3	87	0	0	0	0	1	0	0	0	0
8/31	1	0	0	1	59	0	0	0	0	1	0	0	0	0
9/1	5	0	0	0	633	0	1	0	0	22	0	2	0	0
9/2	3	0	0	2	68	0	1	0	2	4	0	0	0	0
9/3	0	0	0	1	24	0	0	0	0	0	0	0	0	0
9/4	4	0	0	0	133	0	0	0	0	7	0	0	0	0
9/5	4	0	0	0	2,409	0	0	0	0	24	0	0	0	0
9/6	0	0	0	0	1,329	0	0	0	0	44	0	0	0	0
9/7	0	0	0	1	418	0	0	0	0	18	0	0	0	0
9/8	0	0	0	4	274	0	0	0	0	16	0	0	0	0
9/9	1	0	0	0	156	0	1	0	0	17	0	0	0	0
9/10	0	0	0	0	97	0	0	0	0	7	0	0	0	0
	9,958	1,346	82	27	11,487	103	723	4	2	307	2	7	5	0

Appendix 3. Chum salmon daily and cumulative counts and cumulative proportion passing through the Tuluksak River weir, 1991-1994, 2001 and 2002.

Date	Daily Counts						Cumulative Counts						Cumulative Proportions								
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
6/10						0								0							0.0000
6/11						0								0							0.0000
6/12						0	0							0							0.0000
6/13						0	0							0							0.0000
6/14						1	0							1							0.0001
6/15						1	0							2							0.0002
6/16						0	0							2							0.0002
6/17						0	0							2							0.0002
6/18			1			0	0		1					2				0.0001			0.0002
6/19	1	1				0	1	2						2	0.0001	0.0001					0.0002
6/20	0	0				0	1	2						2	0.0001	0.0001					0.0002
6/21	0	10				0	1	12						2	0.0001	0.0009					0.0002
6/22	0	2				15	1	14						17	0.0001	0.0010					0.0017
6/23	1	1				0	2	15						17	0.0003	0.0011					0.0017
6/24	0	1	7			10	2	1	22					27	0.0003	0.0001	0.0016				0.0027
6/25	0	39	18			8	2	40	40					35	0.0003	0.0036	0.0029				0.0035
6/26	3	80	17			30	5	120	57					65	0.0007	0.0107	0.0041				0.0065
6/27	6	75	22			22	11	195	79					87	0.0014	0.0174	0.0057				0.0087
6/28	2	71	42			191	13	266	121					278	0.0017	0.0238	0.0088				0.0279
6/29	11	93	26	8		59	173	24	359	147	8	0	59	451	0.0031	0.0321	0.0106	0.0005	0.0000	0.0030	0.0453
6/30	20	170	37	4		100	54	44	529	184	12	0	159	505	0.0057	0.0473	0.0133	0.0008	0.0000	0.0082	0.0507
7/1	23	242	101	8		157	230	67	771	285	20	0	315	735	0.0087	0.0689	0.0206	0.0013	0.0000	0.0163	0.0738
7/2	50	96	146	34		134	102	117	867	431	54	0	450	837	0.0152	0.0775	0.0312	0.0034	0.0000	0.0233	0.0841
7/3	64	155	119	35		160	51	181	1022	550	89	0	609	888	0.0236	0.0914	0.0398	0.0057	0.0000	0.0316	0.0892
7/4	113	140	154	96		215	80	294	1162	704	185	0	824	968	0.0383	0.1039	0.0510	0.0118	0.0000	0.0427	0.0972
7/5	97	150	149	121		215	198	391	1312	853	306	0	1039	1166	0.0509	0.1173	0.0618	0.0195	0.0000	0.0538	0.1171
7/6	59	107	205	70	0	176	220	450	1419	1058	376	0	1216	1386	0.0586	0.1269	0.0766	0.0239	0.0000	0.0630	0.1392
7/7	115	158	313	321	0	349	295	565	1577	1371	697	0	1564	1681	0.0736	0.1410	0.0993	0.0443	0.0000	0.0810	0.1688
7/8	279	229	312	294	196	196	30	844	1806	1683	991	196	1760	1711	0.1100	0.1615	0.1219	0.0630	0.0111	0.0912	0.1718
7/9	161	228	242	288	99	99	79	1005	2034	1925	1279	295	1859	1790	0.1309	0.1819	0.1395	0.0813	0.0168	0.0963	0.1798
7/10	326	280	255	211	150	150	75	1331	2314	2180	1490	445	2009	1865	0.1734	0.2069	0.1579	0.0948	0.0253	0.1041	0.1873
7/11	296	241	379	495	367	367	545	1627	2555	2559	1985	812	2376	2410	0.2120	0.2285	0.1854	0.1262	0.0461	0.1231	0.2420
7/12	276	202	215	401	574	574	230	1903	2757	2774	2386	1386	2950	2640	0.2479	0.2465	0.2010	0.1517	0.0788	0.1528	0.2651
7/13	169	254	341	553	648	648	451	2072	3011	3115	2939	2034	3598	3091	0.2700	0.2692	0.2257	0.1869	0.1156	0.1863	0.3104

-continue-

Appendix 3. (Continued)

Date	Daily Counts					Cumulative Counts					Cumulative Proportions										
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
7/14	120	307	467	476	985	985	284	2192	3318	3582	3415	3019	4583	3375	0.2856	0.2967	0.2595	0.2172	0.1715	0.2373	0.3389
7/15	169	418	413	754	771	771	196	2361	3736	3995	4169	3790	5354	3571	0.3076	0.3341	0.2894	0.2651	0.2154	0.2773	0.3586
7/16	210	387	402	615	949	949	675	2571	4123	4397	4784	4739	6303	4246	0.3350	0.3687	0.3185	0.3043	0.2693	0.3264	0.4264
7/17	158	174	816	625	228	228	686	2729	4297	5213	5409	4967	6531	4932	0.3556	0.3842	0.3776	0.3440	0.2822	0.3382	0.4953
7/18	390	510	1010	587	441	441	764	3119	4807	6223	5996	5408	6972	5696	0.4064	0.4298	0.4508	0.3813	0.3073	0.3611	0.5720
7/19	298	318	745	942	737	737	620	3417	5125	6968	6938	6145	7709	6316	0.4452	0.4583	0.5048	0.4412	0.3492	0.3992	0.6343
7/20	234	265	534	808	923	923	76	3651	5390	7502	7746	7068	8632	6392	0.4757	0.4820	0.5435	0.4926	0.4016	0.4470	0.6419
7/21	219	260	563	690	582	582	191	3870	5650	8065	8436	7650	9214	6583	0.5042	0.5052	0.5843	0.5365	0.4347	0.4772	0.6611
7/22	232	483	377	1006	656	656	210	4102	6133	8442	9442	8306	9870	6793	0.5345	0.5484	0.6116	0.6005	0.4720	0.5111	0.6822
7/23	154	559	250	952	1,063	1,063	370	4256	6692	8692	10394	9369	10933	7163	0.5545	0.5984	0.6297	0.6610	0.5324	0.5662	0.7193
7/24	124	664	243	589	368	368	87	4380	7356	8935	10983	9737	11301	7250	0.5707	0.6578	0.6473	0.6985	0.5533	0.5852	0.7281
7/25	155	430	255	747	889	889	249	4535	7786	9190	11730	10626	12190	7499	0.5909	0.6962	0.6657	0.7460	0.6038	0.6313	0.7531
7/26	107	230	324	525	857	857	254	4642	8016	9514	12255	11483	13047	7753	0.6048	0.7168	0.6892	0.7794	0.6525	0.6756	0.7786
7/27	94	263	451	609	876	876	252	4736	8279	9965	12864	12359	13923	8005	0.6171	0.7403	0.7219	0.8181	0.7023	0.7210	0.8039
7/28	142	330	387	487	620	620	264	4878	8609	10352	13351	12979	14543	8269	0.6356	0.7698	0.7499	0.8491	0.7375	0.7531	0.8304
7/29	260	313	301	374	183	183	161	5138	8922	10653	13725	13162	14726	8430	0.6694	0.7978	0.7717	0.8729	0.7479	0.7626	0.8466
7/30	250	200	322	194	229	229	228	5388	9122	10975	13919	13391	14955	8658	0.7020	0.8157	0.7951	0.8852	0.7609	0.7744	0.8695
7/31	158	238	387	191	724	724	135	5546	9360	11362	14110	14115	15679	8793	0.7226	0.8370	0.8231	0.8974	0.8020	0.8119	0.8830
8/1	131	196	334	173	445	445	172	5677	9556	11696	14283	14560	16124	8965	0.7397	0.8545	0.8473	0.9084	0.8273	0.8350	0.9003
8/2	139	211	248	188	284	284	88	5816	9767	11944	14471	14844	16408	9053	0.7578	0.8734	0.8653	0.9203	0.8435	0.8497	0.9091
8/3	190	143	184	170	267	267	88	6006	9910	12128	14641	15111	16675	9141	0.7825	0.8862	0.8786	0.9311	0.8586	0.8635	0.9180
8/4	168	119	234	175	308	308	142	6174	10029	12362	14816	15419	16983	9283	0.8044	0.8968	0.8955	0.9423	0.8761	0.8795	0.9322
8/5	159	137	213	202	265	265	58	6333	10166	12575	15018	15684	17248	9341	0.8251	0.9091	0.9110	0.9551	0.8912	0.8932	0.9380
8/6	208	135	194	130	390	390	51	6541	10301	12769	15148	16074	17638	9392	0.8522	0.9211	0.9250	0.9634	0.9133	0.9134	0.9432
8/7	153	70	193	89	223	223	58	6694	10371	12962	15237	16297	17861	9450	0.8722	0.9274	0.9390	0.9690	0.9260	0.9249	0.9490
8/8	92	117	148	54	412	412	39	6786	10488	13110	15291	16709	18273	9489	0.8842	0.9379	0.9497	0.9725	0.9494	0.9463	0.9529
8/9	107	103	83	53	179	179	39	6893	10591	13193	15344	16888	18452	9528	0.8981	0.9471	0.9557	0.9758	0.9596	0.9555	0.9568
8/10	118	80	63	63	114	114	41	7011	10671	13256	15407	17002	18566	9569	0.9135	0.9542	0.9603	0.9799	0.9661	0.9614	0.9609
8/11	99	97	54	37	60	60	42	7110	10768	13310	15444	17062	18626	9611	0.9264	0.9629	0.9642	0.9822	0.9695	0.9645	0.9652
8/12	73	82	48	7	86	86	47	7183	10850	13358	15451	17148	18712	9658	0.9359	0.9702	0.9677	0.9826	0.9744	0.9690	0.9699
8/13	78	32	53	23	182	182	35	7261	10882	13411	15474	17330	18894	9693	0.9461	0.9731	0.9715	0.9841	0.9847	0.9784	0.9734
8/14	61	33	50	22	82	82	19	7322	10915	13461	15496	17412	18976	9712	0.9540	0.9760	0.9752	0.9855	0.9894	0.9827	0.9753
8/15	38	28	31	33	83	83	39	7360	10943	13492	15529	17495	19059	9751	0.9590	0.9785	0.9774	0.9876	0.9941	0.9870	0.9792
8/16	53	16	23	22	24	24	50	7413	10959	13515	15551	17519	19083	9801	0.9659	0.9800	0.9791	0.9890	0.9955	0.9882	0.9842
8/17	55	30	15	19	11	11	18	7468	10989	13530	15570	17530	19094	9819	0.9730	0.9827	0.9802	0.9902	0.9961	0.9888	0.9860

-continue-

Appendix 3. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportions							
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	
8/18	31	22	30	18	8	8	23	7499	11011	13560	15588	17538	19102	9842	0.9771	0.9846	0.9823	0.9914	0.9965	0.9892	0.9884	
8/19	29	20	27	7	17	17	21	7528	11031	13587	15595	17555	19119	9863	0.9808	0.9864	0.9843	0.9918	0.9975	0.9901	0.9905	
8/20	27	22	55	9	19	19	17	7555	11053	13642	15604	17574	19138	9880	0.9844	0.9884	0.9883	0.9924	0.9986	0.9911	0.9922	
8/21	16	25	26	2	0	31	14	7571	11078	13668	15606	17574	19169	9894	0.9864	0.9906	0.9901	0.9925	0.9986	0.9926	0.9936	
8/22	9	13	9	3	0	15	16	7580	11091	13677	15609	17574	19184	9910	0.9876	0.9918	0.9908	0.9927	0.9986	0.9934	0.9952	
8/23	17	18	16	6	0	26	9	7597	11109	13693	15615	17574	19210	9919	0.9898	0.9934	0.9920	0.9931	0.9986	0.9948	0.9961	
8/24	11	4	9	5	0	13	3	7608	11113	13702	15620	17574	19224	9922	0.9913	0.9937	0.9926	0.9934	0.9986	0.9955	0.9964	
8/25	13	9	22	1	0	20	4	7621	11122	13724	15621	17574	19244	9926	0.9930	0.9945	0.9942	0.9935	0.9986	0.9965	0.9968	
8/26	7	8	24	18	0	22	2	7628	11130	13748	15639	17574	19265	9928	0.9939	0.9953	0.9959	0.9946	0.9986	0.9976	0.9970	
8/27	6	15	19	18	14	14	3	7634	11145	13767	15657	17588	19279	9931	0.9947	0.9966	0.9973	0.9957	0.9994	0.9984	0.9973	
8/28	2	9	8	9	4	4	0	7636	11154	13775	15666	17592	19283	9931	0.9949	0.9974	0.9979	0.9963	0.9996	0.9986	0.9973	
8/29	7	6	6	10	3	3	1	7643	11160	13781	15675	17595	19286	9932	0.9958	0.9979	0.9983	0.9969	0.9998	0.9987	0.9974	
8/30	11	1	3	9	1	1	8	7654	11161	13784	15685	17596	19287	9940	0.9973	0.9980	0.9986	0.9975	0.9998	0.9988	0.9982	
8/31	6	1	2	5	2	2	1	7660	11162	13786	15690	17598	19289	9941	0.9980	0.9981	0.9987	0.9978	0.9999	0.9989	0.9983	
9/1	0	2	6	3	1	1	5	7660	11164	13792	15693	17599	19290	9946	0.9980	0.9983	0.9991	0.9980	1.0000	0.9989	0.9988	
9/2	6	8	2	3	0	0	3	7666	11172	13794	15696	17599	19290	9949	0.9988	0.9990	0.9993	0.9982	1.0000	0.9989	0.9991	
9/3	1	2	2	1	0	2	0	7667	11174	13796	15697	17599	19293	9949	0.9990	0.9992	0.9994	0.9983	1.0000	0.9990	0.9991	
9/4	4	0	1	8	0	5	4	7671	11174	13797	15705	17599	19298	9953	0.9995	0.9992	0.9995	0.9988	1.0000	0.9993	0.9995	
9/5	2	3	2	3	0	4	4	7673	11177	13799	15708	17599	19302	9957	0.9997	0.9995	0.9996	0.9990	1.0000	0.9995	0.9999	
9/6	1	2	0	2	0	2	0	7674	11179	13799	15710	17599	19304	9957	0.9999	0.9996	0.9996	0.9991	1.0000	0.9996	0.9999	
9/7	0	1	2	4	0	2	0	7674	11180	13801	15714	17599	19307	9957	0.9999	0.9997	0.9998	0.9994	1.0000	0.9998	0.9999	
9/8	0	1	1	5	0	2	0	7674	11181	13802	15719	17599	19309	9957	0.9999	0.9998	0.9999	0.9997	1.0000	0.9999	0.9999	
9/9	0	2	1	1	0	2	1	7674	11183	13803	15720	17599	19311	9958	0.9999	1.0000	0.9999	0.9998	1.0000	1.0000	1.0000	
9/10	0	0	1	0	0	0	0	7674	11183	13804	15721	17599	19311	9958	0.9999	1.0000	1.0000	0.9998	1.0000	1.0000	1.0000	
9/11	0			3				7674		15724					0.9999		1.0000					
9/12	0							7674							0.9999							
9/13	1							7675							1.0000							
9/14	0							7675							1.0000							
9/15	0							7675							1.0000							
9/16	0							7675							1.0000							
9/17	0							7675							1.0000							
9/18	0							7675							1.0000							

Estimated escapement due to high water

Boxed areas represent the second quartile, median, and third quartile of the run

Appendix 4. Estimated age and sex composition of chum salmon passing the Tuluksak River, Alaska, 2002,
and test of age composition between sexes.

	Brood Year and Age Group					
	1999	1998	1997	1996	Total	
	<u>0.2</u>	<u>0.3</u>	<u>0.4</u>	<u>0.5</u>		
Strata 1: 06/10/2002-06/29/2002*						
Sampling Dates: 6/26,6/27,6/28						
Male:	Number in Sample:	0	4	19	2	25
	Estimated % of Escapement:	0	8.7	41.3	4.3	54.3
	Estimated Escapement:	0	39	186	20	245
	Standard Error:	0	18	31.4	13	
Female:	Number in Sample:	0	9	11	1	21
	Estimated % of Escapement:	0	19.6	23.9	2.2	45.7
	Estimated Escapement:	0	88	108	10	206
	Standard Error:	0	25.3	27.2	9.3	
Total:	Number in Sample:	0	13	30	3	46
	Estimated % of Escapement:	0	28.3	65.2	6.5	100
	Estimated Escapement:	0	127	294	29	451
	Standard Error:	0	28.7	30.3	15.7	

Strata 2: 06/30/2002-07/06/2002

Sampling Dates: 7/01,7/02,7/03,7/04,7/05

Male:	Number in Sample:	0	26	27	0	53
	Estimated % of Escapement:	0	26.5	27.6	0	54.1
	Estimated Escapement:	0	248	258	0	506
	Standard Error:	0	39.7	40.1	0	
Female:	Number in Sample:	0	21	24	0	45
	Estimated % of Escapement:	0	21.4	24.5	0	45.9
	Estimated Escapement:	0	200	229	0	429
	Standard Error:	0	36.9	38.6	0	
Total:	Number in Sample:	0	47	51	0	98
	Estimated % of Escapement:	0	48	52	0	100
	Estimated Escapement:	0	448	487	0	935
	Standard Error:	0	44.9	44.9	0	

-continue-

Appendix 4. (Continued)

	Brood Year and Age Group					Total	
	1999 <u>0.2</u>	1998 <u>0.3</u>	1997 <u>0.4</u>	1996 <u>0.5</u>			
Strata 3: 07/07/2002-07/13/2002							
Sampling Dates: 7/08,7/09,7/10,7/11							
Male:	Number in Sample:	0	49	45	0	94	
	Estimated % of Escapement:	0	29	26.6	0	55.6	
	Estimated Escapement:	0	494	454	0	948	
	Standard Error:	0	56.7	55.2	0		
Female:	Number in Sample:	0	51	24	0	75	
	Estimated % of Escapement:	0	30.2	14.2	0	44.4	
	Estimated Escapement:	0	515	242	0	757	
	Standard Error:	0	57.3	43.6	0		
Total:	Number in Sample:	0	100	69	0	169	
	Estimated % of Escapement:	0	59.2	40.8	0	100	
	Estimated Escapement:	0	1,009	696	0	1,705	
	Standard Error:	0	61.4	61.4	0		
Strata 4: 07/14/2002-07/20/2002							
Sampling Dates: 7/15,7/16							
Male:	Number in Sample:	0	50	57	1	108	
	Estimated % of Escapement:	0	28.1	32	0.6	60.7	
	Estimated Escapement:	0	927	1,057	19	2,003	
	Standard Error:	0	108.5	112.6	18		
Female:	Number in Sample:	1	42	27	0	70	
	Estimated % of Escapement:	0.6	23.6	15.2	0	39.3	
	Estimated Escapement:	19	779	501	0	1,298	
	Standard Error:	18	102.5	86.6	0		
Total:	Number in Sample:	1	92	84	1	178	
	Estimated % of Escapement:	0.6	51.7	47.2	0.6	100	
	Estimated Escapement:	19	1,706	1,558	19	3,301	
	Standard Error:	18	120.6	120.5	18		

-continue-

Appendix 4. (Continued)

	Brood Year and Age Group					Total	
	1999 <u>0.2</u>	1998 <u>0.3</u>	1997 <u>0.4</u>	1996 <u>0.5</u>			
Strata 5: 07/21/2002-07/27/2002							
Sampling Dates: 7/22, 7/23, 7/24, 7/26							
Male:	Number in Sample:	9	57	29	0	95	
	Estimated % of Escapement:	5.3	33.3	17	0	55.6	
	Estimated Escapement:	85	538	274	0	896	
	Standard Error:	26.1	55.1	43.9	0		
Female:	Number in Sample:	6	47	23	0	76	
	Estimated % of Escapement:	3.5	27.5	13.5	0	44.4	
	Estimated Escapement:	57	443	217	0	717	
	Standard Error:	21.5	52.2	39.9	0		
Total:	Number in Sample:	15	104	52	0	171	
	Estimated % of Escapement:	8.8	60.8	30.4	0	100	
	Estimated Escapement:	141	981	491	0	1,613	
	Standard Error:	33.1	57.1	53.8	0		
Strata 6: 07/28/2002-08/03/2002							
Sampling Dates: 7/29, 7/30, 7/31, 8/01							
Male:	Number in Sample:	18	39	22	1	80	
	Estimated % of Escapement:	12.2	26.4	14.9	0.7	54.1	
	Estimated Escapement:	138	299	169	8	614	
	Standard Error:	28.6	38.5	31.1	7.2		
Female:	Number in Sample:	21	34	13	0	68	
	Estimated % of Escapement:	14.2	23	8.8	0	45.9	
	Estimated Escapement:	161	261	100	0	522	
	Standard Error:	30.5	36.8	24.7	0		
Total:	Number in Sample:	39	73	35	1	148	
	Estimated % of Escapement:	26.4	49.3	23.6	0.7	100	
	Estimated Escapement:	299	560	269	8	1,136	
	Standard Error:	38.5	43.7	37.1	7.2		

-continue-

Appendix 4. (Continued)

	Brood Year and Age Group					Total	
	1999 0.2	1998 0.3	1997 0.4	1996 0.5			
Strata 7: 08/04/2002-09/10/2002**							
Sampling Dates: 8/05,8/06,8/07,8/08,8/19,8/20,8/21							
Male:	Number in Sample: Estimated % of Escapement: Estimated Escapement: Standard Error:	19 15.8 129 25.3	22 18.3 150 26.8	7 5.8 48 16.2	1 0.8 7 6.3	49 40.8 334	
Female:	Number in Sample: Estimated % of Escapement: Estimated Escapement: Standard Error:	19 15.8 129 25.3	43 35.8 293 33.2	9 7.5 61 18.2	0 0 0 0	71 59.2 483	
Total:	Number in Sample: Estimated % of Escapement: Estimated Escapement: Standard Error:	38 31.7 259 32.2	65 54.2 443 34.5	16 13.3 109 23.5	1 0.8 7 6.3	120 100 817	
Strata 1-7: 06/09/2002-09/10/2002							
Male:	Number in Sample: % Males in Age Group: Estimated % of Escapement: Estimated Escapement: Standard Error: Estimated Design Effects:	46 6.4 3.5 352 46.2 0.672	247 48.6 27.1 2,696 148.7 1.142	206 44.1 24.6 2,445 146.5 1.176	5 0.9 0.5 53 24.2 1.135	504 100 55.7 5,546 1.125	
Female:	Number in Sample: % Females in Age Group: Estimated % of Escapement: Estimated Escapement: Standard Error: Estimated Design Effects:	47 8.3 3.7 366 48.5 0.709	247 58.5 25.9 2,579 144.8 1.116	131 33 14.6 1,458 119 1.154	1 0.2 0.1 10 9.3 0.916	426 100 44.3 4,412 1.125	
Total:	Number in Sample: Estimated % of Escapement: Estimated Escapement: Standard Error: Estimated Design Effects:	93 7.2 718 62.7 0.628	494 53 5,275 165.8 1.126	337 39.2 3,903 161.4 1.111	6 0.6 62 25.8 1.09	930 100 9,958	

* Stratum 1 includes June 10 and all dates up to and including June 29, 2002.

** Stratum 7 includes August 4 and all dates following through September 10, 2002.

Appendix 5. Chinook salmon daily and cumulative counts and cumulative proportion passing through the Tuluksak River weir, 1991-1994, 2001, and 2002.

Date	Daily Counts						Cumulative Counts						Cumulative Proportion								
	1991	1992	1993	1994	2001	2002	1991	1992	1993	1994	2001	2002	1991	1992	1993	1994	2001	2001a	2002		
6/10						0						0							0.0000		
6/11						0						0							0.0000		
6/12	0					0	0					0	0.0000							0.0000	
6/13	0					0	0					0	0.0000							0.0000	
6/14	0					0	0					0	0.0000							0.0000	
6/15	0					0	0					0	0.0000							0.0000	
6/16	0					0	0					0	0.0000							0.0000	
6/17	0					0	0					0	0.0000							0.0000	
6/18	0					0	0					0	0.0000							0.0000	
6/19	0	0				0	0	0				0	0.0000		0.0000					0.0000	
6/20	0	0				0	0	0				0	0.0000		0.0000					0.0000	
6/21	0	0				1	0	0				1	0.0000		0.0000					0.0007	
6/22	0	1				0	0	1				1	0.0000		0.0005					0.0007	
6/23	1	0				0	1	1				1	0.0014		0.0005					0.0007	
6/24	3	0	0			1	4	0	1			2	0.0057	0.0000	0.0005					0.0015	
6/25	0	0	1			1	4	0	2			3	0.0057	0.0000	0.0009					0.0022	
6/26	3	1	0			0	7	1	2			3	0.0100	0.0009	0.0009					0.0022	
6/27	3	0	2			4	10	1	4			7	0.0143	0.0009	0.0018					0.0052	
6/28	4	2	1			9	14	3	5			16	0.0201	0.0028	0.0023					0.0119	
6/29	1	4	0	0		1	133	15	7	5	0	1	149	0.0215	0.0065	0.0023	0.0000		0.0013	0.1107	
6/30	6	10	14	5		6	26	21	17	19	5	8	175	0.0301	0.0157	0.0086	0.0017		0.0077	0.1300	
7/1	8	15	40	4		11	17	29	32	59	9	19	192	0.0416	0.0295	0.0266	0.0031		0.0189	0.1426	
7/2	6	12	35	5		9	6	35	44	94	14	28	198	0.0502	0.0406	0.0424	0.0048		0.0282	0.1471	
7/3	6	22	102	3		19	7	41	66	196	17	47	205	0.0588	0.0609	0.0884	0.0058		0.0472	0.1523	
7/4	28	85	84	26		41	11	69	151	280	43	88	216	0.0990	0.1394	0.1262	0.0147		0.0886	0.1605	
7/5	13	40	120	69		33	59	82	191	400	112	122	275	0.1176	0.1764	0.1803	0.0384		0.1219	0.2043	
7/6	24	13	187	29	0	35	247	106	204	587	141	0	157	522	0.1521	0.1884	0.2647	0.0483	0.0000	0.1571	0.3878
7/7	15	28	157	391	0	63	57	121	232	744	532	0	220	579	0.1736	0.2142	0.3354	0.1823	0.0000	0.2201	0.4302
7/8	23	55	37	109	19	19	48	144	287	781	641	19	239	627	0.2066	0.2650	0.3521	0.2197	0.0245	0.2392	0.4658
7/9	37	71	93	184	3	3	22	181	358	874	825	22	242	649	0.2597	0.3306	0.3940	0.2828	0.0283	0.2422	0.4822
7/10	254	117	171	70	12	12	2	435	475	1045	895	34	254	651	0.6241	0.4386	0.4711	0.3068	0.0438	0.2542	0.4837

-continue-

Appendix 5. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportion						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
7/11	8	53	100	144	66	66	51	443	528	1145	1039	100	320	702	0.6356	0.4875	0.5162	0.3561	0.1287	0.3203	0.5215
7/12	38	25	215	254	63	63	29	481	553	1360	1293	163	383	731	0.6901	0.5106	0.6132	0.4432	0.2098	0.3834	0.5431
7/13	12	32	107	176	90	90	194	493	585	1467	1469	253	473	925	0.7073	0.5402	0.6614	0.5035	0.3256	0.4736	0.6872
7/14	4	47	80	160	218	218	27	497	632	1547	1629	471	691	952	0.7131	0.5836	0.6975	0.5584	0.6062	0.6920	0.7073
7/15	5	38	43	142	26	26	12	502	670	1590	1771	497	717	964	0.7202	0.6187	0.7169	0.6070	0.6396	0.7180	0.7162
7/16	11	32	58	83	31	31	24	513	702	1648	1854	528	748	988	0.7360	0.6482	0.7430	0.6355	0.6795	0.7491	0.7340
7/17	32	8	63	85	9	9	26	545	710	1711	1939	537	757	1014	0.7819	0.6556	0.7714	0.6646	0.6911	0.7581	0.7533
7/18	43	24	60	150	13	13	74	588	734	1771	2089	550	770	1088	0.8436	0.6777	0.7985	0.7160	0.7079	0.7711	0.8083
7/19	27	27	64	191	23	23	54	615	761	1835	2280	573	793	1142	0.8824	0.7027	0.8273	0.7815	0.7375	0.7942	0.8484
7/20	15	12	61	165	24	24	13	630	773	1896	2445	597	817	1155	0.9039	0.7138	0.8548	0.8380	0.7683	0.8182	0.8581
7/21	14	16	47	96	13	13	21	644	789	1943	2541	610	830	1176	0.9240	0.7285	0.8760	0.8710	0.7851	0.8312	0.8737
7/22	10	40	54	77	19	19	16	654	829	1997	2618	629	849	1192	0.9383	0.7655	0.9004	0.8973	0.8095	0.8503	0.8856
7/23	3	46	18	18	18	18	19	657	875	2015	2636	647	867	1211	0.9426	0.8079	0.9085	0.9035	0.8327	0.8683	0.8997
7/24	12	67	23	32	4	4	3	669	942	2038	2668	651	871	1214	0.9598	0.8698	0.9188	0.9145	0.8378	0.8723	0.9019
7/25	5	44	10	68	16	16	30	674	986	2048	2736	667	887	1244	0.9670	0.9104	0.9234	0.9378	0.8584	0.8883	0.9242
7/26	1	12	15	23	9	9	25	675	998	2063	2759	676	896	1269	0.9684	0.9215	0.9301	0.9457	0.8700	0.8974	0.9428
7/27	4	9	24	36	20	20	28	679	1007	2087	2795	696	916	1297	0.9742	0.9298	0.9409	0.9580	0.8958	0.9174	0.9636
7/28	2	8	24	36	2	2	5	681	1015	2111	2831	698	918	1302	0.9770	0.9372	0.9518	0.9704	0.8983	0.9194	0.9673
7/29	4	7	14	9	3	3	4	685	1022	2125	2840	701	921	1306	0.9828	0.9437	0.9581	0.9734	0.9022	0.9224	0.9703
7/30	1	9	21	12	2	2	6	686	1031	2146	2852	703	923	1312	0.9842	0.9520	0.9675	0.9776	0.9048	0.9244	0.9747
7/31	0	5	10	2	12	12	13	686	1036	2156	2854	715	935	1325	0.9842	0.9566	0.9720	0.9782	0.9202	0.9364	0.9844
8/1	0	6	10	8	5	5	2	686	1042	2166	2862	720	940	1327	0.9842	0.9621	0.9766	0.9810	0.9266	0.9414	0.9859
8/2	2	3	2	5	7	7	3	688	1045	2168	2867	727	947	1330	0.9871	0.9649	0.9775	0.9827	0.9356	0.9485	0.9881
8/3	1	4	1	5	6	6	4	689	1049	2169	2872	733	953	1334	0.9885	0.9686	0.9779	0.9844	0.9434	0.9545	0.9911
8/4	0	2	7	4	5	5	2	689	1051	2176	2876	738	958	1336	0.9885	0.9705	0.9811	0.9858	0.9498	0.9595	0.9926
8/5	0	7	4	6	5	5	0	689	1058	2180	2882	743	963	1336	0.9885	0.9769	0.9829	0.9878	0.9562	0.9645	0.9926
8/6	1	4	9	8	3	3	1	690	1062	2189	2890	746	966	1337	0.9900	0.9806	0.9869	0.9906	0.9601	0.9675	0.9933
8/7	0	3	13	2	3	3	2	690	1065	2202	2892	749	969	1339	0.9900	0.9834	0.9928	0.9913	0.9640	0.9705	0.9948
8/8	0	2	3	5	2	2	0	690	1067	2205	2897	751	971	1339	0.9900	0.9852	0.9941	0.9930	0.9665	0.9725	0.9948
8/9	0	1	5	2	3	3	2	690	1068	2210	2899	754	974	1341	0.9900	0.9861	0.9964	0.9937	0.9704	0.9755	0.9963
8/10	0	0	1	1	1	1	1	690	1068	2211	2900	755	975	1342	0.9900	0.9861	0.9968	0.9940	0.9717	0.9765	0.9970
8/11	0	2	5	2	0	0	1	690	1070	2216	2902	755	975	1343	0.9900	0.9880	0.9991	0.9947	0.9717	0.9765	0.9978

-continue-

Appendix 5. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportion						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
8/12	1	0	1	0	5	5	1	691	1070	2217	2902	760	980	1344	0.9914	0.9880	0.9995	0.9947	0.9781	0.9815	0.9985
8/13	3	0	0	2	9	9	0	694	1070	2217	2904	769	989	1344	0.9957	0.9880	0.9995	0.9954	0.9897	0.9905	0.9985
8/14	1	1	0	1	0	0	0	695	1071	2217	2905	769	989	1344	0.9971	0.9889	0.9995	0.9957	0.9897	0.9905	0.9985
8/15	1	1	0	2	2	2	0	696	1072	2217	2907	771	991	1344	0.9986	0.9898	0.9995	0.9964	0.9923	0.9925	0.9985
8/16	0	0	0	1	3	3	0	696	1072	2217	2908	774	994	1344	0.9986	0.9898	0.9995	0.9967	0.9961	0.9955	0.9985
8/17	0	0	0	0	2	2	0	696	1072	2217	2908	776	996	1344	0.9986	0.9898	0.9995	0.9967	0.9987	0.9975	0.9985
8/18	0	1	1	1	0	0	0	696	1073	2218	2909	776	996	1344	0.9986	0.9908	1.0000	0.9971	0.9987	0.9975	0.9985
8/19	0	0	0	0	1	1	2	696	1073	2218	2909	777	997	1346	0.9986	0.9908	1.0000	0.9971	1.0000	0.9985	1.0000
8/20	0	0	0	1	0	0	0	696	1073	2218	2910	777	997	1346	0.9986	0.9908	1.0000	0.9974	1.0000	0.9985	1.0000
8/21	1	2	0	1	0	1	0	697	1075	2218	2911	777	998	1346	1.0000	0.9926	1.0000	0.9978	1.0000	0.9995	1.0000
8/22	0	1	0	0	0	0	0	697	1076	2218	2911	777	998	1346	1.0000	0.9935	1.0000	0.9978	1.0000	0.9997	1.0000
8/23	0	0	0	0	0	0	0	697	1076	2218	2911	777	998	1346	1.0000	0.9935	1.0000	0.9978	1.0000	0.9997	1.0000
8/24	0	0	0	0	0	0	0	697	1076	2218	2911	777	998	1346	1.0000	0.9935	1.0000	0.9978	1.0000	0.9997	1.0000
8/25	0	1	0	0	0	0	0	697	1077	2218	2911	777	998	1346	1.0000	0.9945	1.0000	0.9978	1.0000	0.9999	1.0000
8/26	0	0	0	0	0	0	0	697	1077	2218	2911	777	998	1346	1.0000	0.9945	1.0000	0.9978	1.0000	0.9999	1.0000
8/27	0	0	0	0	0	0	0	697	1077	2218	2911	777	998	1346	1.0000	0.9945	1.0000	0.9978	1.0000	0.9999	1.0000
8/28	0	1	0	1	0	0	0	697	1078	2218	2912	777	998	1346	1.0000	0.9954	1.0000	0.9981	1.0000	0.9999	1.0000
8/29	0	0	0	0	0	0	0	697	1078	2218	2912	777	998	1346	1.0000	0.9954	1.0000	0.9981	1.0000	0.9999	1.0000
8/30	0	2	0	2	0	0	0	697	1080	2218	2914	777	998	1346	1.0000	0.9972	1.0000	0.9987	1.0000	0.9999	1.0000
8/31	0	0	0	0	0	0	0	697	1080	2218	2914	777	998	1346	1.0000	0.9972	1.0000	0.9987	1.0000	0.9999	1.0000
9/1	0	2	0	2	0	0	0	697	1082	2218	2915	777	998	1346	1.0000	0.9991	1.0000	0.9993	1.0000	0.9999	1.0000
9/2	0	1	0	0	0	0	0	697	1083	2218	2915	777	998	1346	1.0000	1.0000	1.0000	0.9993	1.0000	0.9999	1.0000
9/3	0	0	0	0	0	0	0	697	1083	2218	2915	777	998	1346	1.0000	1.0000	1.0000	0.9993	1.0000	0.9999	1.0000
9/4	0	0	0	1	0	0	0	697	1083	2218	2916	777	998	1346	1.0000	1.0000	1.0000	0.9997	1.0000	1.0000	1.0000
9/5	0	0	0	0	0	0	0	697	1083	2218	2916	777	998	1346	1.0000	1.0000	1.0000	0.9997	1.0000	1.0000	1.0000
9/6	0	0	0	0	0	0	0	697	1083	2218	2916	777	998	1346	1.0000	1.0000	1.0000	0.9997	1.0000	1.0000	1.0000
9/7	0	0	0	0	0	0	0	697	1083	2218	2916	777	998	1346	1.0000	1.0000	1.0000	0.9997	1.0000	1.0000	1.0000
9/8	0	0	0	0	0	0	0	697	1083	2218	2916	777	998	1346	1.0000	1.0000	1.0000	0.9997	1.0000	1.0000	1.0000
9/9	0	0	0	0	0	0	0	697	1083	2218	2916	777	998	1346	1.0000	1.0000	1.0000	0.9997	1.0000	1.0000	1.0000
9/10	0	0	0	0	0	0	0	697	1083	2218	2916	777	998	1346	1.0000	1.0000	1.0000	0.9997	1.0000	1.0000	1.0000
9/11	0		1					697		2917			1.0000			1.0000					
9/12	0							697						1.0000							

-continue-

Appendix 5. (Continued)

Date	Daily Counts						Cumulative Counts						Cumulative Proportion									
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	
9/13	0							697							1.0000							
9/14	0							697							1.0000							
9/15	0							697							1.0000							
9/16	0							697							1.0000							
9/17	0							697							1.0000							
9/18	0							697							1.0000							



Estimated escapement due to high water.

Boxed areas represent the second quartile, median and third quartile of the run.

Appendix 6. Estimated age and sex composition of chinook salmon passage from the Tuluksak River, Alaska, 2002, and test of age composition between sexes.

	Brood Year and Age Group							Total
	1999	1998	1997	1996	1995	1997		
	1.1	1.2	1.3	1.4	1.5	2.2		
Strata 1: 06/09/2002-06/29/2002								
Sampling Dates: 6/26,6/27,6/28								
Male:								
Number in Sample:	0	5	0	0	0	0	5	
Estimated % of Escapement:	0	62.5	0	0	0	0	62.5	
Estimated Escapement:	0	93	0	0	0	0	93	
Standard Error:	0	26.5	0	0	0	0	0	
Female:								
Number in Sample:	0	0	1	2	0	0	3	
Estimated % of Escapement:	0	0	12.5	25	0	0	37.5	
Estimated Escapement:	0	0	19	37	0	0	56	
Standard Error:	0	0	18.1	23.7	0	0	0	
Total:								
Number in Sample:	0	5	1	2	0	0	8	
Estimated % of Escapement:	0	62.5	12.5	25	0	0	100	
Estimated Escapement:	0	93	19	37	0	0	149	
Standard Error:	0	26.5	18.1	23.7	0	0	0	

Strata 2: 06/30/2002-07/06/2002

Sampling Dates: 7/01,7/02,7/03,7/04,7/05

Male:	Number in Sample:	2	13	3	3	0	0	11
	Estimated % of Escapement:	8.3	54.2	12.5	12.5	0	0	44
	Estimated Escapement:	31	202	47	47	0	0	164
	Standard Error:	20.8	37.5	24.9	24.9	0	0	
Female:	Number in Sample:	0	0	1	1	0	1	3
	Estimated % of Escapement:	0	0	4.2	4.2	0	4.2	12.5
	Estimated Escapement:	0	0	16	16	0	16	47
	Standard Error:	0	0	15	15	0	15	
Total:	Number in Sample:	2	13	4	4	0	1	24
	Estimated % of Escapement:	8.3	54.2	16.7	16.7	0	4.2	100
	Estimated Escapement:	31	202	62	62	0	16	373
	Standard Error:	20.8	37.5	28	28	0	15	

-continue-

Appendix 6. (Continued)

	Brood Year and Age Group							Total
	1999	1998	1997	1996	1995	1997		
	1.1	1.2	1.3	1.4	1.5	2.2		
Strata 3: 07/07/2002-07/13/2002								
Sampling Dates: 7/08,7/09,7/10,7/11								
Male:								
Number in Sample:	0	11	23	9	1	0	44	
Estimated % of Escapement:	0	21.6	45.1	17.6	2	0	86.3	
Estimated Escapement:	0	87	182	71	8	0	348	
Standard Error:	0	21.9	26.5	20.3	7.4	0		
Female:								
Number in Sample:	0	0	0	7	0	0	7	
Estimated % of Escapement:	0	0	0	13.7	0	0	13.7	
Estimated Escapement:	0	0	0	55	0	0	55	
Standard Error:	0	0	0	18.3	0	0		
Total:								
Number in Sample:	0	11	23	16	1	0	51	
Estimated % of Escapement:	0	21.6	45.1	31.4	2	0	100	
Estimated Escapement:	0	87	182	126	8	0	403	
Standard Error:	0	21.9	26.5	24.7	7.4	0		

Strata 4: 07/14/2002-07/20/2002

Sampling Dates: 7/15,7/16,7/17,7/18,7/19

Male:	Number in Sample:	0	22	17	6	0	0	45
	Estimated % of Escapement:	0	33.3	25.8	9.1	0	0	68.2
	Estimated Escapement:	0	77	59	21	0	0	157
	Standard Error:	0	11.4	10.5	6.9	0	0	
Female:	Number in Sample:	0	0	2	16	3	0	21
	Estimated % of Escapement:	0	0	3	24.2	4.5	0	31.8
	Estimated Escapement:	0	0	7	56	10	0	73
	Standard Error:	0	0	4.1	10.3	5	0	
Total:	Number in Sample:	0	22	19	22	3	0	66
	Estimated % of Escapement:	0	33.3	28.8	33.3	4.5	0	100
	Estimated Escapement:	0	77	66	77	10	0	230
	Standard Error:	0	11.4	10.9	11.4	5	0	

-continue-

Appendix 6. (Continued)

	Brood Year and Age Group							
	1999	1998	1997	1996	1995	1997		
	1.1	1.2	1.3	1.4	1.5	2.2	Total	
Strata 5: 07/21/2002-07/27/2002								
Sampling Dates: 7/22, 7/23, 7/24, 7/26								
Male:	Number in Sample:	0	7	7	1	0	0	14
	Estimated % of Escapement:	0	23.3	23.3	3.3	0	0	46.7
	Estimated Escapement:	0	33	33	5	0	0	66
	Standard Error:	0	9.9	9.9	4.2	0	0	
Female:	Number in Sample:	0	0	2	12	1	0	15
	Estimated % of Escapement:	0	0	6.7	40	3.3	0	50
	Estimated Escapement:	0	0	9	57	5	0	71
	Standard Error:	0	0	5.8	11.5	4.2	0	
Total:	Number in Sample:	0	7	9	13	1	0	30
	Estimated % of Escapement:	0	23.3	30	43.3	3.3	0	100
	Estimated Escapement:	0	33	43	62	5	0	142
	Standard Error:	0	9.9	10.7	11.6	4.2	0	

Strata 6: 07/28/2002-09/10/2002

Sampling Dates: 7/29, 7/30, 7/31, 8/01, 8/06, 8/07

Male:	Number in Sample:	0	2	4	1	0	0	7
	Estimated % of Escapement:	0	15.4	30.8	7.7	0	0	53.8
	Estimated Escapement:	0	8	15	4	0	0	26
	Standard Error:	0	4.4	5.6	3.2	0	0	
Female:	Number in Sample:	0	0	3	1	2	0	6
	Estimated % of Escapement:	0	0	23.1	7.7	15.4	0	46.2
	Estimated Escapement:	0	0	11	4	8	0	23
	Standard Error:	0	0	5.1	3.2	4.4	0	
Total:	Number in Sample:	0	2	7	2	2	0	13
	Estimated % of Escapement:	0	15.4	53.8	15.4	15.4	0	100
	Estimated Escapement:	0	8	26	8	8	0	49
	Standard Error:	0	4.4	6	4.4	4.4	0	

-continue-

Appendix 6. (Continued)

		Brood Year and Age Group						
		1999	1998	1997	1996	1995	1997	Total
		1.1	1.2	1.3	1.4	1.5	2.2	
Strata 1-6: 06/09/2002-09/10/2002								
Male:	Number in Sample:	2	60	54	20	1	0	137
	% Males in Age Group:	2.9	48.5	33.1	14.7	0.8	0	100
	Estimated % of Escapement:	2.2	37.1	25.3	11.2	0.6	0	76.4
	Estimated Escapement:	30	499	340	151	8	0	1,028
	Standard Error:	19.2	53	41	35	7.4	0	
	Estimated Design Effects:	1.922	1.4	1.065	1.432	1.128	0	1.218
Female:	Number in Sample:	0	0	9	39	6	1	55
	% Females in Age Group:	0	0	18.8	68.7	7.2	5.3	100
	Estimated % of Escapement:	0	0	4.4	16.2	1.7	1.3	23.6
	Estimated Escapement:	0	0	60	218	23	17	318
	Standard Error:	0	0	23.6	35	7.9	16.4	
	Estimated Design Effects:	0	0	1.525	1.084	0.532	2.437	1.218
Total:	Number in Sample:	2	60	63	59	7	1	192
	Estimated % of Escapement:	2.2	37.1	29.7	27.5	2.3	1.3	100
	Estimated Escapement:	30	499	400	370	31	17	1,346
	Standard Error:	19.2	53	45.9	46.8	10.8	16.4	
	Estimated Design Effects:	1.922	1.4	1.199	1.3	0.693	2.437	

Appendix 7. Sockeye salmon daily and cumulative counts and cumulative proportion passing the Tuluksak River Weir, 1991-1994, 2001 and 2002.

Date	Daily Counts							Cumulative Counts							Cumulative Proportions							
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	
6/10							0							0							0.0000	
6/11							0							0							0.0000	
6/12	0						0	0						0	0.0000							0.0000
6/13	0						0	0						0	0.0000							0.0000
6/14	0						0	0						0	0.0000							0.0000
6/15	0						0	0						0	0.0000							0.0000
6/16	0						0	0						0	0.0000							0.0000
6/17	0						0	0						0	0.0000							0.0000
6/18	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/19	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/20	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/21	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/22	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/23	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/24	0	0	0				0	0	0	0				0	0.0000	0.0000	0.0000				0.0000	
6/25	0	0	0				0	0	0	0				0	0.0000	0.0000	0.0000				0.0000	
6/26	0	0	0				1	0	0	0				1	0.0000	0.0000	0.0000				0.0122	
6/27	0	0	0				2	0	0	0				3	0.0000	0.0000	0.0000				0.0366	
6/28	0	0	0				0	0	0	0				3	0.0000	0.0000	0.0000				0.0366	
6/29	0	0	0	0			0	0	0	0	0		0	3	0.0000	0.0000	0.0000	0.0000			0.0366	
6/30	0	0	0	0			0	0	0	0	0		0	3	0.0000	0.0000	0.0000	0.0000			0.0366	
7/1	0	0	0	0			0	1	0	0	0	0	0	4	0.0000	0.0000	0.0000	0.0000			0.0488	
7/2	0	0	0	0			0	0	0	0	0	0	0	4	0.0000	0.0000	0.0000	0.0000			0.0488	
7/3	0	0	1	0			0	0	0	1	0	0	0	4	0.0000	0.0000	0.0114	0.0000			0.0028	
7/4	0	0	0	0			0	0	0	1	0	0	0	4	0.0000	0.0000	0.0114	0.0000			0.0028	
7/5	0	0	0	0			0	12	0	0	1	0	0	16	0.0000	0.0000	0.0114	0.0000			0.0028	
7/6	0	0	0	0	0		0	15	0	0	1	0	0	31	0.0000	0.0000	0.0114	0.0000	0.0000		0.0028	
7/7	0	0	0	0	0		0	6	0	0	1	0	0	37	0.0000	0.0000	0.0114	0.0000	0.0000		0.0028	
7/8	0	0	0	0	0		0	0	0	1	0	0	0	37	0.0000	0.0000	0.0114	0.0000	0.0000		0.0028	
7/9	0	0	0	0	0		0	1	0	0	1	0	0	38	0.0000	0.0000	0.0114	0.0000	0.0000		0.0028	
7/10	0	2	4	2	0		0	1	0	2	5	2	0	39	0.0000	0.0155	0.0568	0.0244	0.0000		0.4756	

continue-

Appendix 7. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportions						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
7/11	1	1	4	0	2	2	0	1	3	9	2	2	2	39	0.0294	0.0233	0.1023	0.0244	0.0153	0.0175	0.4756
7/12	2	0	2	0	2	2	0	3	3	11	2	4	4	39	0.0882	0.0233	0.1250	0.0244	0.0305	0.0321	0.4756
7/13	0	0	2	0	3	3	0	3	3	13	2	7	7	39	0.0882	0.0233	0.1477	0.0244	0.0534	0.0540	0.4756
7/14	0	2	4	0	2	2	6	3	5	17	2	9	9	45	0.0882	0.0388	0.1932	0.0244	0.0687	0.0686	0.5488
7/15	0	0	1	0	6	6	3	3	5	18	2	15	15	48	0.0882	0.0388	0.2045	0.0244	0.1145	0.1125	0.5854
7/16	0	4	1	0	11	11	4	3	9	19	2	26	26	52	0.0882	0.0698	0.2159	0.0244	0.1985	0.1928	0.6341
7/17	1	1	4	2	3	3	5	4	10	23	4	29	29	57	0.1176	0.0775	0.2614	0.0488	0.2214	0.2148	0.6951
7/18	5	1	3	3	12	12	8	9	11	26	7	41	41	65	0.2647	0.0853	0.2955	0.0854	0.3130	0.3025	0.7927
7/19	1	2	5	0	12	12	2	10	13	31	7	53	53	67	0.2941	0.1008	0.3523	0.0854	0.4046	0.3901	0.8171
7/20	3	2	7	1	4	4	0	13	15	38	8	57	57	67	0.3824	0.1163	0.4318	0.0976	0.4351	0.4194	0.8171
7/21	2	2	8	1	6	6	0	15	17	46	9	63	63	67	0.4412	0.1318	0.5227	0.1098	0.4809	0.4632	0.8171
7/22	1	5	0	1	2	2	1	16	22	46	10	65	65	68	0.4706	0.1705	0.5227	0.1220	0.4962	0.4778	0.8293
7/23	0	20	2	0	1	1	0	16	42	48	10	66	66	68	0.4706	0.3256	0.5455	0.1220	0.5038	0.4851	0.8293
7/24	0	22	7	6	1	1	0	16	64	55	16	67	67	68	0.4706	0.4961	0.6250	0.1951	0.5115	0.4924	0.8293
7/25	2	8	0	11	4	4	0	18	72	55	27	71	71	68	0.5294	0.5581	0.6250	0.3293	0.5420	0.5217	0.8293
7/26	0	3	3	2	2	2	1	18	75	58	29	73	73	69	0.5294	0.5814	0.6591	0.3537	0.5573	0.5363	0.8415
7/27	0	1	2	1	8	8	1	18	76	60	30	81	81	70	0.5294	0.5891	0.6818	0.3659	0.6183	0.5948	0.8537
7/28	0	6	1	3	8	8	0	18	82	61	33	89	89	70	0.5294	0.6357	0.6932	0.4024	0.6794	0.6532	0.8537
7/29	3	4	6	3	1	1	2	21	86	67	36	90	90	72	0.6176	0.6667	0.7614	0.4390	0.6870	0.6605	0.8780
7/30	1	4	2	2	1	1	2	22	90	69	38	91	91	74	0.6471	0.6977	0.7841	0.4634	0.6947	0.6678	0.9024
7/31	0	1	4	2	4	4	0	22	91	73	40	95	95	74	0.6471	0.7054	0.8295	0.4878	0.7252	0.6971	0.9024
8/1	0	4	5	1	11	11	0	22	95	78	41	106	106	74	0.6471	0.7364	0.8864	0.5000	0.8092	0.7774	0.9024
8/2	0	3	0	2	7	7	0	22	98	78	43	113	113	74	0.6471	0.7597	0.8864	0.5244	0.8626	0.8286	0.9024
8/3	0	1	0	2	3	3	0	22	99	78	45	116	116	74	0.6471	0.7674	0.8864	0.5488	0.8855	0.8505	0.9024
8/4	1	0	0	3	1	1	0	23	99	78	48	117	117	74	0.6765	0.7674	0.8864	0.5854	0.8931	0.8578	0.9024
8/5	3	1	2	3	3	3	0	26	100	80	51	120	120	74	0.7647	0.7752	0.9091	0.6220	0.9160	0.8797	0.9024
8/6	0	2	1	3	3	3	0	26	102	81	54	123	123	74	0.7647	0.7907	0.9205	0.6585	0.9389	0.9017	0.9024
8/7	0	2	1	1	3	3	0	26	104	82	55	126	126	74	0.7647	0.8062	0.9318	0.6707	0.9618	0.9236	0.9024
8/8	1	0	1	1	1	1	0	27	104	83	56	127	127	74	0.7941	0.8062	0.9432	0.6829	0.9695	0.9309	0.9024
8/9	0	0	0	2	0	0	0	27	104	83	58	127	127	74	0.7941	0.8062	0.9432	0.7073	0.9695	0.9309	0.9024
8/10	0	2	1	2	0	0	2	27	106	84	60	127	127	76	0.7941	0.8217	0.9545	0.7317	0.9695	0.9309	0.9268
8/11	0	1	1	6	0	0	1	27	107	85	66	127	127	77	0.7941	0.8295	0.9659	0.8049	0.9695	0.9309	0.9390

-continue-

Appendix 7. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportions						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
8/12	1	0	0	0	0	0	2	28	107	85	66	127	127	79	0.8235	0.8295	0.9659	0.8049	0.9695	0.9309	0.9634
8/13	1	0	0	1	0	0	0	29	107	85	67	127	127	79	0.8529	0.8295	0.9659	0.8171	0.9695	0.9309	0.9634
8/14	1	0	0	0	2	2	0	30	107	85	67	129	129	79	0.8824	0.8295	0.9659	0.8171	0.9847	0.9455	0.9634
8/15	0	0	0	2	0	0	1	30	107	85	69	129	129	80	0.8824	0.8295	0.9659	0.8415	0.9847	0.9455	0.9756
8/16	0	1	1	5	0	0	0	30	108	86	74	129	129	80	0.8824	0.8372	0.9773	0.9024	0.9847	0.9455	0.9756
8/17	0	2	0	0	0	0	0	30	110	86	74	129	129	80	0.8824	0.8527	0.9773	0.9024	0.9847	0.9455	0.9756
8/18	0	1	0	0	1	1	0	30	111	86	74	130	130	80	0.8824	0.8605	0.9773	0.9024	0.9924	0.9528	0.9756
8/19	0	1	0	3	1	1	0	30	112	86	77	131	131	80	0.8824	0.8682	0.9773	0.9390	1.0000	0.9601	0.9756
8/20	1	6	0	0	0	0	0	31	118	86	77	131	131	80	0.9118	0.9147	0.9773	0.9390	1.0000	0.9601	0.9756
8/21	0	1	0	0	0	0	0	31	119	86	77	131	132	82	0.9118	0.9225	0.9773	0.9390	1.0000	0.9621	1.0000
8/22	0	2	0	1	0	1	0	31	121	86	78	131	133	82	0.9118	0.9380	0.9773	0.9512	1.0000	0.9690	1.0000
8/23	0	0	0	1	0	0	0	31	121	86	79	131	133	82	0.9118	0.9380	0.9773	0.9634	1.0000	0.9720	1.0000
8/24	0	0	0	1	0	0	0	31	121	86	80	131	133	82	0.9118	0.9380	0.9773	0.9756	1.0000	0.9751	1.0000
8/25	1	1	0	0	0	1	0	32	122	86	80	131	135	82	0.9412	0.9457	0.9773	0.9756	1.0000	0.9844	1.0000
8/26	0	0	0	0	0	0	0	32	122	86	80	131	135	82	0.9412	0.9457	0.9773	0.9756	1.0000	0.9844	1.0000
8/27	0	0	1	0	0	0	0	32	122	87	80	131	135	82	0.9412	0.9457	0.9886	0.9756	1.0000	0.9844	1.0000
8/28	0	0	1	0	0	0	0	32	122	88	80	131	135	82	0.9412	0.9457	1.0000	0.9756	1.0000	0.9844	1.0000
8/29	0	1	0	0	0	0	0	32	123	88	80	131	135	82	0.9412	0.9535	1.0000	0.9756	1.0000	0.9844	1.0000
8/30	0	0	0	0	0	0	0	32	123	88	80	131	135	82	0.9412	0.9535	1.0000	0.9756	1.0000	0.9844	1.0000
8/31	0	0	0	0	0	0	0	32	123	88	80	131	135	82	0.9412	0.9535	1.0000	0.9756	1.0000	0.9844	1.0000
9/1	0	3	0	1	0	0	0	32	126	88	81	131	135	82	0.9412	0.9767	1.0000	0.9878	1.0000	0.9844	1.0000
9/2	0	0	0	0	0	0	0	32	126	88	81	131	135	82	0.9412	0.9767	1.0000	0.9878	1.0000	0.9844	1.0000
9/3	0	1	0	0	0	0	0	32	127	88	81	131	135	82	0.9412	0.9845	1.0000	0.9878	1.0000	0.9863	1.0000
9/4	0	1	0	0	0	0	0	32	128	88	81	131	135	82	0.9412	0.9922	1.0000	0.9878	1.0000	0.9883	1.0000
9/5	0	0	0	0	0	0	0	32	128	88	81	131	135	82	0.9412	0.9922	1.0000	0.9878	1.0000	0.9883	1.0000
9/6	0	1	0	0	0	0	0	32	129	88	81	131	136	82	0.9412	1.0000	1.0000	0.9878	1.0000	0.9902	1.0000
9/7	0	0	0	0	0	0	0	32	129	88	81	131	136	82	0.9412	1.0000	1.0000	0.9878	1.0000	0.9902	1.0000
9/8	0	0	0	0	0	0	0	32	129	88	81	131	136	82	0.9412	1.0000	1.0000	0.9878	1.0000	0.9902	1.0000
9/9	0	0	0	0	0	0	0	32	129	88	81	131	136	82	0.9412	1.0000	1.0000	0.9878	1.0000	0.9902	1.0000
9/10	1	0	0	1	0	1	0	33	129	88	82	131	137	82	0.9706	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
9/11	0		0					33			82				0.9706			1.0000			
9/12	0							33							0.9706						

-continue-

Appendix 7. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportions						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
9/13	0							33							0.9706						
9/14	0							33							0.9706						
9/15	0							33							0.9706						
9/16	1							34							1.0000						
9/17	0							34							1.0000						
9/18	0							34							1.0000						

Estimated escapement due to high water.

Boxed areas represent the second quartile, median and third quartile of the run.

Appendix 8. Pink salmon daily and cumulative counts and cumulative proportion passing the Tuluksak River Weir, 1991-1994, 2001, and 2002.

Date	Daily Counts							Cumulative Counts							Cumulative Proportions							
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	
6/10							0							0							0.0000	
6/11							0							0							0.0000	
6/12	0						0	0						0	0.0000							0.0000
6/13	0						0	0						0	0.0000							0.0000
6/14	0						0	0						0	0.0000							0.0000
6/15	0						0	0						0	0.0000							0.0000
6/16	0						0	0						0	0.0000							0.0000
6/17	0						0	0						0	0.0000							0.0000
6/18	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/19	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/20	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/21	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/22	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/23	0	0					0	0	0					0	0.0000	0.0000					0.0000	
6/24	0	0	0				0	0	0	0				0	0.0000	0.0000	0.0000				0.0000	
6/25	0	0	0				0	0	0	0				0	0.0000	0.0000	0.0000				0.0000	
6/26	0	0	0				0	0	0	0				0	0.0000	0.0000	0.0000				0.0000	
6/27	0	0	0				0	0	0	0				0	0.0000	0.0000	0.0000				0.0000	
6/28	0	0	0				0	0	0	0				0	0.0000	0.0000	0.0000				0.0000	
6/29	0	0	0	1		0	0	0	0	1		0	0	0.0000	0.0000	0.0000	0.0003	0.0001		0.0000		
6/30	0	0	0	0		0	0	0	0	1		0	0	0.0000	0.0000	0.0000	0.0003	0.0001		0.0000		
7/1	0	0	0	0		0	0	0	0	1		0	0	0.0000	0.0000	0.0000	0.0003	0.0001		0.0000		
7/2	0	0	0	0		0	1	0	0	1		0	1	0.0000	0.0000	0.0000	0.0003	0.0001	0.0370			
7/3	0	1	0	0		0	2	0	1	0	1	0	3	0.0000	0.0004	0.0000	0.0003	0.0002	0.1111			
7/4	0	0	0	0		0	0	0	1	0	1	0	3	0.0000	0.0004	0.0000	0.0003	0.0002	0.1111			
7/5	0	1	0	0		0	1	0	2	0	1	0	4	0.0000	0.0008	0.0000	0.0003	0.0003	0.1481			
7/6	1	1	0	0	0	0	0	1	3	0	1	0	4	0.0026	0.0012	0.0000	0.0003	0.0000	0.0010	0.1481		
7/7	0	1	0	3	0	0	0	1	4	0	4	0	4	0.0026	0.0016	0.0000	0.0011	0.0000	0.0013	0.1481		
7/8	0	2	0	9	0	0	1	1	6	0	13	0	5	0.0026	0.0024	0.0000	0.0037	0.0000	0.0013	0.1852		
7/9	1	2	0	6	0	0	0	2	8	0	19	0	5	0.0051	0.0032	0.0000	0.0054	0.0000	0.0013	0.1852		
7/10	3	3	0	4	0	0	0	5	11	0	23	0	5	0.0128	0.0045	0.0000	0.0066	0.0000	0.0013	0.1852		

-continue-

Appendix 8. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportions						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
7/11	1	2	0	12	0	0	0	6	13	0	35	0	0	5	0.0153	0.0053	0.0000	0.0100	0.0000	0.0013	0.1852
7/12	5	3	0	18	0	0	0	11	16	0	53	0	0	5	0.0281	0.0065	0.0000	0.0152	0.0000	0.0013	0.1852
7/13	1	3	3	12	0	0	1	12	19	3	65	0	0	6	0.0306	0.0077	0.0143	0.0186	0.0000	0.0013	0.2222
7/14	2	4	1	48	0	0	0	14	23	4	113	0	0	6	0.0357	0.0093	0.0190	0.0324	0.0000	0.0013	0.2222
7/15	2	5	0	30	0	0	1	16	28	4	143	0	0	7	0.0408	0.0113	0.0190	0.0410	0.0000	0.0013	0.2593
7/16	2	9	1	19	0	0	0	18	37	5	162	0	0	7	0.0459	0.0150	0.0238	0.0465	0.0000	0.0013	0.2593
7/17	5	3	5	20	0	0	1	23	40	10	182	0	0	8	0.0587	0.0162	0.0476	0.0522	0.0000	0.0013	0.2963
7/18	54	33	3	28	0	0	0	77	73	13	210	0	0	8	0.1964	0.0296	0.0619	0.0602	0.0000	0.0013	0.2963
7/19	65	21	2	50	0	0	0	142	94	15	260	0	0	8	0.3622	0.0381	0.0714	0.0746	0.0000	0.0013	0.2963
7/20	59	10	3	54	0	0	2	201	104	18	314	0	0	10	0.5128	0.0421	0.0857	0.0900	0.0000	0.0013	0.3704
7/21	28	19	4	80	0	0	0	229	123	22	394	0	0	10	0.5842	0.0498	0.1048	0.1130	0.0000	0.0013	0.3704
7/22	39	17	3	68	0	0	0	268	140	25	462	0	0	10	0.6837	0.0567	0.1190	0.1325	0.0000	0.0013	0.3704
7/23	11	21	1	71	3	3	0	279	161	26	533	3	3	10	0.7117	0.0652	0.1238	0.1529	0.0667	0.0639	0.3704
7/24	7	67	3	24	2	2	0	286	228	29	557	5	5	10	0.7296	0.0923	0.1381	0.1597	0.1111	0.1056	0.3704
7/25	8	60	3	57	1	1	1	294	288	32	614	6	6	11	0.7500	0.1166	0.1524	0.1761	0.1333	0.1265	0.4074
7/26	9	46	9	35	1	1	1	303	334	41	649	7	7	12	0.7730	0.1352	0.1952	0.1861	0.1556	0.1473	0.4444
7/27	7	57	9	64	1	1	0	310	391	50	713	8	8	12	0.7908	0.1583	0.2381	0.2045	0.1778	0.1682	0.4444
7/28	1	43	4	52	0	0	0	311	434	54	765	8	8	12	0.7934	0.1757	0.2571	0.2194	0.1778	0.1682	0.4444
7/29	6	83	5	78	0	0	0	317	517	59	843	8	8	12	0.8087	0.2093	0.2810	0.2418	0.1778	0.1682	0.4444
7/30	12	101	8	94	0	0	0	329	618	67	937	8	8	12	0.8393	0.2502	0.3190	0.2687	0.1778	0.1682	0.4444
7/31	2	126	18	95	1	1	0	331	744	85	1032	9	9	12	0.8444	0.3012	0.4048	0.2960	0.2000	0.1890	0.4444
8/1	3	50	6	114	5	5	0	334	794	91	1146	14	14	12	0.8520	0.3215	0.4333	0.3286	0.3111	0.2933	0.4444
8/2	4	79	7	102	4	4	0	338	873	98	1248	18	18	12	0.8622	0.3534	0.4667	0.3579	0.4000	0.3767	0.4444
8/3	3	43	4	192	1	1	1	341	916	102	1440	19	19	13	0.8699	0.3709	0.4857	0.4130	0.4222	0.3976	0.4815
8/4	1	49	3	201	3	3	0	342	965	105	1641	22	22	13	0.8724	0.3907	0.5000	0.4706	0.4889	0.4601	0.4815
8/5	5	94	1	186	1	1	0	347	1059	106	1827	23	23	13	0.8852	0.4287	0.5048	0.5239	0.5111	0.4810	0.4815
8/6	7	104	7	206	4	4	0	354	1163	113	2033	27	27	13	0.9031	0.4709	0.5381	0.5830	0.6000	0.5644	0.4815
8/7	1	82	10	193	0	0	0	355	1245	123	2226	27	27	13	0.9056	0.5040	0.5857	0.6384	0.6000	0.5644	0.4815
8/8	6	100	4	181	0	0	0	361	1345	127	2407	27	27	13	0.9209	0.5445	0.6048	0.6903	0.6000	0.5644	0.4815
8/9	5	145	4	92	0	0	0	366	1490	131	2499	27	27	13	0.9337	0.6032	0.6238	0.7167	0.6000	0.5644	0.4815
8/10	3	98	1	115	4	4	0	369	1588	132	2614	31	31	13	0.9413	0.6429	0.6286	0.7496	0.6889	0.6478	0.4815
8/11	3	92	3	108	1	1	0	372	1680	135	2722	32	32	13	0.9490	0.6802	0.6429	0.7806	0.7111	0.6687	0.4815

-continue-

Appendix 8. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportions						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
8/12	3	201	5	27	3	3	0	375	1881	140	2749	35	35	13	0.9566	0.7615	0.6667	0.7884	0.7778	0.7312	0.4815
8/13	0	65	6	150	0	0	0	375	1946	146	2899	35	35	13	0.9566	0.7879	0.6952	0.8314	0.7778	0.7312	0.4815
8/14	1	86	4	105	1	1	0	376	2032	150	3004	36	36	13	0.9592	0.8227	0.7143	0.8615	0.8000	0.7521	0.4815
8/15	0	46	4	84	2	2	0	376	2078	154	3088	38	38	13	0.9592	0.8413	0.7333	0.8856	0.8444	0.7938	0.4815
8/16	1	28	2	80	0	0	0	377	2106	156	3168	38	38	13	0.9617	0.8526	0.7429	0.9085	0.8444	0.7938	0.4815
8/17	2	39	4	51	2	2	1	379	2145	160	3219	40	40	14	0.9668	0.8684	0.7619	0.9231	0.8889	0.8355	0.5185
8/18	3	47	5	16	0	0	0	382	2192	165	3235	40	40	14	0.9745	0.8874	0.7857	0.9277	0.8889	0.8355	0.5185
8/19	0	64	5	12	0	0	0	382	2256	170	3247	40	40	14	0.9745	0.9134	0.8095	0.9312	0.8889	0.8355	0.5185
8/20	0	16	3	11	0	0	0	382	2272	173	3258	40	40	14	0.9745	0.9198	0.8238	0.9343	0.8889	0.8355	0.5185
8/21	1	36	8	8	0	1	0	383	2308	181	3266	40	41	14	0.9770	0.9344	0.8619	0.9366	0.8889	0.8499	0.5185
8/22	0	15	2	9	0	0	0	383	2323	183	3275	40	41	14	0.9770	0.9405	0.8714	0.9392	0.8889	0.8544	0.5185
8/23	0	7	8	12	0	1	0	383	2330	191	3287	40	42	14	0.9770	0.9433	0.9095	0.9426	0.8889	0.8655	0.5185
8/24	0	6	1	11	0	0	0	383	2336	192	3298	40	42	14	0.9770	0.9457	0.9143	0.9458	0.8889	0.8681	0.5185
8/25	1	8	4	6	0	0	0	384	2344	196	3304	40	42	14	0.9796	0.9490	0.9333	0.9475	0.8889	0.8747	0.5185
8/26	0	3	3	18	0	0	0	384	2347	199	3322	40	42	14	0.9796	0.9502	0.9476	0.9527	0.8889	0.8799	0.5185
8/27	0	21	2	21	0	0	0	384	2368	201	3343	40	42	14	0.9796	0.9587	0.9571	0.9587	0.8889	0.8799	0.5185
8/28	0	26	2	23	2	2	1	384	2394	203	3366	42	44	15	0.9796	0.9692	0.9667	0.9653	0.9333	0.9216	0.5556
8/29	0	10	1	10	3	3	0	384	2404	204	3376	45	47	15	0.9796	0.9733	0.9714	0.9682	1.0000	0.9842	0.5556
8/30	0	10	2	16	0	0	3	384	2414	206	3392	45	47	18	0.9796	0.9773	0.9810	0.9728	1.0000	0.9842	0.6667
8/31	0	4	1	7	0	0	1	384	2418	207	3399	45	47	19	0.9796	0.9789	0.9857	0.9748	1.0000	0.9842	0.7037
9/1	2	4	0	8	0	0	0	386	2422	207	3407	45	47	19	0.9847	0.9806	0.9857	0.9771	1.0000	0.9842	0.7037
9/2	0	14	2	9	0	0	2	386	2436	209	3416	45	47	21	0.9847	0.9862	0.9952	0.9796	1.0000	0.9886	0.7778
9/3	0	8	1	8	0	0	1	386	2444	210	3424	45	48	22	0.9847	0.9895	1.0000	0.9819	1.0000	0.9912	0.8148
9/4	0	5	0	13	0	0	0	386	2449	210	3437	45	48	22	0.9847	0.9915	1.0000	0.9857	1.0000	0.9926	0.8148
9/5	0	7	0	5	0	0	0	386	2456	210	3442	45	48	22	0.9847	0.9943	1.0000	0.9871	1.0000	0.9937	0.8148
9/6	0	7	0	7	0	0	0	386	2463	210	3449	45	48	22	0.9847	0.9972	1.0000	0.9891	1.0000	0.9949	0.8148
9/7	0	1	0	8	0	0	1	386	2464	210	3457	45	48	23	0.9847	0.9976	1.0000	0.9914	1.0000	0.9956	0.8519
9/8	0	3	0	16	0	0	4	386	2467	210	3473	45	48	27	0.9847	0.9988	1.0000	0.9960	1.0000	0.9970	1.0000
9/9	0	2	0	1	0	0	0	386	2469	210	3474	45	48	27	0.9847	0.9996	1.0000	0.9963	1.0000	0.9973	1.0000
9/10	3	1	0	9	0	0	0	389	2470	210	3483	45	48	27	0.9923	1.0000	1.0000	0.9989	1.0000	1.0000	1.0000
9/11	0			4				389			3487				0.9923			1.0000			
9/12	1							390							0.9949						

-continue-

Appendix 8. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportions						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
9/13	1							391							0.9974						
9/14	0							391							0.9974						
9/15	0							391							0.9974						
9/16	0							391							0.9974						
9/17	0							391							0.9974						
9/18	1							392							1.0000						

Estimated escapement due to high water.

Boxed areas represent the second quartile, median and third quartile of the run.

Appendix 9. Coho salmon daily and cumulative counts and cumulative proportion passing through the Tuluksak River weir, 1991-1994, 2001, and 2002.

Date	<u>Daily Counts</u>						<u>Cumulative Counts</u>						<u>Cumulative Proportion</u>						
	1991	1992	1993	1994	2001	2002	1991	1992	1993	1994	2001	2002	1991	1992	1993	1994	2001	2001a	2002
6/10					0							0							0.0000
6/11					0							0							0.0000
6/12	0				0	0						0	0.0000						0.0000
6/13	0				0	0						0	0.0000						0.0000
6/14	0				0	0						0	0.0000						0.0000
6/15	0				0	0						0	0.0000						0.0000
6/16	0				0	0						0	0.0000						0.0000
6/17	0				0	0						0	0.0000						0.0000
6/18	0	0			0	0	0					0	0.0000	0.0000					0.0000
6/19	0	0			0	0	0					0	0.0000	0.0000					0.0000
6/20	0	0			0	0	0					0	0.0000	0.0000					0.0000
6/21	0	0			0	0	0					0	0.0000	0.0000					0.0000
6/22	0	0			0	0	0					0	0.0000	0.0000					0.0000
6/23	0	0			0	0	0					0	0.0000	0.0000					0.0000
6/24	0	0	0		0	0	0	0				0	0.0000	0.0000	0.0000				0.0000
6/25	0	0	0		0	0	0	0				0	0.0000	0.0000	0.0000				0.0000
6/26	0	0	0		0	0	0	0				0	0.0000	0.0000	0.0000				0.0000
6/27	0	0	0		0	0	0	0				0	0.0000	0.0000	0.0000				0.0000
6/28	0	0	0		0	0	0	0				0	0.0000	0.0000	0.0000				0.0000
6/29	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6/30	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/1	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/2	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/3	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/4	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/5	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/6	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/7	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/8	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/9	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/10	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

-continue-

Appendix 9. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportion						
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002
7/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7/23	0	1	3	0	0	0	0	0	1	3	0	0	0	0	0.0000	0.0001	0.0004	0.0000	0.0000	0.0000	0.0000
7/24	0	1	1	0	0	0	0	0	2	4	0	0	0	0	0.0000	0.0003	0.0005	0.0000	0.0000	0.0000	0.0000
7/25	0	0	1	3	0	0	0	0	2	5	3	0	0	0	0.0000	0.0003	0.0006	0.0004	0.0000	0.0000	0.0000
7/26	0	1	0	7	0	0	0	0	3	5	10	0	0	0	0.0000	0.0004	0.0006	0.0014	0.0000	0.0000	0.0000
7/27	0	0	1	7	0	0	0	0	3	6	17	0	0	0	0.0000	0.0004	0.0007	0.0024	0.0000	0.0000	0.0000
7/28	0	1	1	7	2	2	0	0	4	7	24	2	2	0	0.0000	0.0005	0.0008	0.0034	0.0002	0.0001	0.0000
7/29	0	1	7	7	6	6	2	0	5	14	31	8	8	2	0.0000	0.0007	0.0017	0.0043	0.0008	0.0003	0.0002
7/30	0	4	3	14	5	5	2	0	9	17	45	13	13	4	0.0000	0.0012	0.0020	0.0063	0.0012	0.0005	0.0003
7/31	0	1	2	7	25	25	0	0	10	19	52	38	38	4	0.0000	0.0013	0.0023	0.0073	0.0036	0.0016	0.0003
8/1	0	3	4	8	38	38	1	0	13	23	60	76	76	5	0.0000	0.0017	0.0028	0.0084	0.0073	0.0031	0.0004
8/2	0	3	4	10	23	23	0	0	16	27	70	99	99	5	0.0000	0.0021	0.0032	0.0098	0.0095	0.0041	0.0004
8/3	0	2	7	20	19	19	3	0	18	34	90	118	118	8	0.0000	0.0024	0.0041	0.0126	0.0113	0.0048	0.0007
8/4	1	3	25	27	9	9	8	1	21	59	117	127	127	16	0.0002	0.0028	0.0071	0.0163	0.0122	0.0052	0.0014
8/5	2	20	22	33	8	8	2	3	41	81	150	135	135	18	0.0006	0.0055	0.0097	0.0209	0.0129	0.0055	0.0016
8/6	0	28	21	30	6	6	6	3	69	102	180	141	141	24	0.0006	0.0092	0.0122	0.0251	0.0135	0.0058	0.0021
8/7	4	21	66	14	21	21	7	7	90	168	194	162	162	31	0.0015	0.0120	0.0202	0.0271	0.0155	0.0066	0.0027
8/8	0	11	50	34	91	91	6	7	101	218	228	253	253	37	0.0015	0.0135	0.0262	0.0318	0.0243	0.0104	0.0032
8/9	3	16	111	2	31	31	19	10	117	329	230	284	284	56	0.0022	0.0156	0.0395	0.0321	0.0272	0.0116	0.0049
8/10	4	17	83	32	21	21	9	14	134	412	262	305	305	65	0.0030	0.0179	0.0495	0.0366	0.0292	0.0125	0.0057
8/11	4	42	129	44	23	23	46	18	176	541	306	328	328	111	0.0039	0.0235	0.0650	0.0427	0.0314	0.0134	0.0097

-continue-

Appendix 9. (Continued)

Date	Daily Counts							Cumulative Counts							Cumulative Proportion							
	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	1991	1992	1993	1994	2001	2001a	2002	
8/12	16	81	42	12	21	21	197	34	257	583	318	349	349	308	0.0073	0.0343	0.0700	0.0444	0.0335	0.0143	0.0268	
8/13	19	44	42	42	216	216	94	53	301	625	360	565	565	402	0.0114	0.0401	0.0750	0.0503	0.0542	0.0231	0.0350	
8/14	20	121	149	29	226	226	8	73	422	774	389	791	791	410	0.0157	0.0563	0.0929	0.0543	0.0758	0.0324	0.0357	
8/15	2	186	117	70	1,191	1,191	61	75	608	891	459	1982	1982	471	0.0161	0.0811	0.1070	0.0641	0.1900	0.0812	0.0410	
8/16	25	43	46	102	781	781	66	100	651	937	561	2763	2763	537	0.0215	0.0868	0.1125	0.0783	0.2649	0.1132	0.0467	
8/17	26	80	67	429	1,013	1,013	103	126	731	1004	990	3776	3776	640	0.0271	0.0975	0.1206	0.1382	0.3620	0.1546	0.0557	
8/18	55	93	105	122	147	147	14	181	824	1109	1112	3923	3923	654	0.0389	0.1099	0.1332	0.1552	0.3761	0.1607	0.0569	
8/19	66	154	137	122	1,079	1,079	160	247	978	1246	1234	5002	5002	814	0.0531	0.1304	0.1496	0.1723	0.4796	0.2049	0.0709	
8/20	70	64	166	101	865	865	183	317	1042	1412	1335	5867	5867	997	0.0682	0.1389	0.1695	0.1864	0.5625	0.2403	0.0868	
8/21	89	367	358	124	0	753	275	406	1409	1770	1459	5867	6620	1272	0.0873	0.1878	0.2125	0.2037	0.5625	0.2724	0.1107	
8/22	42	529	342	225	0	885	1,131	448	1938	2112	1684	5867	7504	2403	0.0963	0.2584	0.2536	0.2351	0.5625	0.3104	0.2092	
8/23	59	318	199	601	0	918	415	507	2256	2311	2285	5867	8423	2818	0.1090	0.3008	0.2775	0.3190	0.5625	0.3511	0.2453	
8/24	52	101	143	363	0	520	248	559	2357	2454	2648	5867	8942	3066	0.1202	0.3142	0.2947	0.3697	0.5625	0.3742	0.2669	
8/25	380	420	211	807	0	1,572	777	939	2777	2665	3455	5867	10514	3843	0.2019	0.3702	0.3200	0.4824	0.5625	0.4431	0.3346	
8/26	139	246	396	319	0	873	1,011	1078	3023	3061	3718	5867	11388	4854	0.2318	0.4030	0.3676	0.5191	0.5625	0.4799	0.4226	
8/27	79	647	504	584	754	754	406	1157	3670	3565	4109	6621	12142	5260	0.2488	0.4893	0.4281	0.5737	0.6348	0.5108	0.4579	
8/28	0	902	221	584	733	733	401	1157	4572	3786	4460	7354	12875	5661	0.2488	0.6095	0.4546	0.6226	0.7051	0.5408	0.4928	
8/29	1	448	227	346	1,309	1,309	139	1158	5020	4013	4668	8663	14184	5800	0.2490	0.6692	0.4819	0.6517	0.8306	0.5944	0.5049	
8/30	135	557	406	489	684	684	87	1293	5577	4419	5031	9347	14868	5887	0.2780	0.7435	0.5306	0.7024	0.8962	0.6224	0.5125	
8/31	150	161	617	380	653	653	59	1443	5738	5036	5336	10000	15521	5946	0.3103	0.7650	0.6047	0.7450	0.9588	0.6491	0.5176	
9/1	149	174	545	352	430	430	633	1592	5912	5581	5624	10430	15951	6579	0.3423	0.7882	0.6701	0.7852	1.0000	0.6668	0.5727	
9/2	165	922	620	107	0	1,463	68	1757	6834	6201	5731	10430	17414	6647	0.3778	0.9111	0.7446	0.8001	1.0000	0.7287	0.5787	
9/3	193	199	1274	101	0	1,389	24	1950	7033	7475	5832	10430	18803	6671	0.4193	0.9376	0.8976	0.8142	1.0000	0.7875	0.5807	
9/4	356	105	247	183	0	851	133	2306	7138	7722	6015	10430	19654	6804	0.4958	0.9516	0.9272	0.8398	1.0000	0.8239	0.5923	
9/5	389	236	134	266	0	978	2,409	2695	7374	7856	6281	10430	20632	9213	0.5794	0.9831	0.9433	0.8769	1.0000	0.8660	0.8020	
9/6	898	84	70	212	0	1,422	1,329	3593	7458	7926	6493	10430	22054	10542	0.7725	0.9943	0.9517	0.9065	1.0000	0.9266	0.9177	
9/7	312	18	171	109	0	616	418	3905	7476	8097	6602	10430	22670	10960	0.8396	0.9967	0.9723	0.9217	1.0000	0.9529	0.9541	
9/8	180	1	70	273	0	485	274	4085	7477	8167	6875	10430	23155	11234	0.8783	0.9968	0.9807	0.9598	1.0000	0.9742	0.9780	
9/9	157	8	90	47	0	362	156	4242	7485	8257	6984	10430	23517	11390	0.9121	0.9979	0.9915	0.9750	1.0000	0.9894	0.9916	
9/10	98	16	71	42	0	251	97	4340	7501	8328	7060	10430	23768	11487	0.9331	1.0000	1.0000	0.9856	1.0000	1.0000	1.0000	
9/11	40		103			4380			7163						0.9417			1.0000				
9/12	59					4439									0.9544							

-continue-

Appendix 9. (Continued)

Date	Daily Counts						Cumulative Counts						Cumulative Proportion						
	1991	1992	1993	1994	2001	2002	1991	1992	1993	1994	2001	2002	1991	1992	1993	1994	2001	2001a	2002
9/13	45						4484						0.9641						
9/14	35						4519						0.9716						
9/15	20						4539						0.9759						
9/16	29						4568						0.9822						
9/17	59						4627						0.9948						
9/18	24						4651						1.0000						

Estimated escapement due to high water.

Boxed areas represent the second quartile, median and third quartile of the run.

Appendix 10. Estimated age and sex composition of coho salmon passing the Tuluksak River, Alaska, 2002,
and test of age composition between sexes.

	Brood Year and Age Group				Total
	1999	1998	1997		
	1.1	2.1	3.1		
Strata 1: 7/28/2002-8/24/2002*					
Sampling Dates: 7/29,8/1,8/05,8/06,8/07,8/08,8/19,8/20,8/21,8/22,					
Male	Number in Sample:	1	111	9	121
	Estimated % of Escapement:	0.6	64.2	5.2	69.9
	Estimated Escapement:	18	1,967	160	2,144
	Standard Error:	17.2	108.9	50.4	
Female	Number in Sample:	0	43	9	52
	Estimated % of Escapement:	0	24.9	5.2	30.1
	Estimated Escapement:	0	762	160	922
	Standard Error:	0	98.1	50.4	
Total:	Number in Sample:	1	154	18	173
	Estimated % of Escapement:	0.6	89	10.4	100
	Estimated Escapement:	18	2,729	319	3,066
	Standard Error:	17.2	71	69.3	
Strata 2: 8/25/2002-8/31/2002					
Sampling Dates: 8/26,8/27					
Male	Number in Sample:	0	64	13	77
	Estimated % of Escapement:	0	39.8	8.1	47.8
	Estimated Escapement:	0	1,145	233	1,377
	Standard Error:	0	108.3	60.3	
Female	Number in Sample:	1	66	17	84
	Estimated % of Escapement:	0.6	41	10.6	52.2
	Estimated Escapement:	18	1,181	304	1,503
	Standard Error:	17.4	108.8	68	
Total:	Number in Sample:	1	130	30	161
	Estimated % of Escapement:	0.6	80.7	18.6	100
	Estimated Escapement:	18	2,325	537	2,880
	Standard Error:	17.4	87.2	86.1	

-continue-

Appendix 10. (Continued)

		Brood Year and Age Group					
		1999	1998	1997	Total		
		1.1	2.1	3.1			
Strata 3: 9/1/2002-9/10/2002							
Sampling Dates: 9/04,9/05,9/06							
Male	Number in Sample:	0	31	5	36		
	Estimated % of Escapement:	0	20.5	3.3	23.8		
	Estimated Escapement:	0	1,138	183	1,321		
	Standard Error:	0	180.2	79.8			
Female	Number in Sample:	1	100	14	115		
	Estimated % of Escapement:	0.7	66.2	9.3	76.2		
	Estimated Escapement:	37	3,670	514	4,220		
	Standard Error:	36.2	211	129.4			
Total:	Number in Sample:	1	131	19	151		
	Estimated % of Escapement:	0.7	86.8	12.6	100		
	Estimated Escapement:	37	4,807	697	5,541		
	Standard Error:	36.2	151.3	148			
Strata 1-3: 7/28/2002-9/10/2002							
Male	Number in Sample:	1	206	27	234		
	% Females in Age Group:	0.4	87.8	11.9	100		
	Estimated % of Escapement:	0.2	37	5	42.2		
	Estimated Escapement:	18	4,250	576	4,843		
	Standard Error:	17.2	236.8	112			
	Estimated Design Effects:	0.748	0.919	1.009	0.926		
Female	Number in Sample:	2	209	40	251		
	% Males in Age Group:	0.8	84.5	14.7	100		
	Estimated % of Escapement:	0.5	48.9	8.5	57.8		
	Estimated Escapement:	55	5,612	977	6,644		
	Standard Error:	40.1	256.9	154.6			
	Estimated Design Effects:	1.293	1.006	1.169	0.926		
Total:	Number in Sample:	3	415	67	485		
	Estimated % of Escapement:	0.6	85.9	13.5	100		
	Estimated Escapement:	72	9,862	1,553	11,487		
	Standard Error:	43.7	188.5	184.7			
	Estimated Design Effects:	1.161	1.115	1.113			

Stratum 1 includes July 28 and all dates up to and including August 24, 2002.

Appendix 11. Daily and cumulative counts and cumulative proportion of salmon carcasses passing the Tuluksak River weir, 2002.

Date	Daily Mortalities					Cumulative Daily Mortalities					Cumulative Proportion Mortalities				
	Chum	Chinook	Sockeye	Pink	Coho	Chum	Chinook	Sockeye	Pink	Coho	Chum	Chinook	Sockeye	Pink	Coho
6/10	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/11	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/12	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/13	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/14	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/15	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/16	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/17	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/18	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/19	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/20	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/21	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/22	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/23	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/24	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/25	0	0	0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000
6/26	2	0	0	0	0	2	0	0	0	0	0.0009	0.0000	0.0000	0.0000	0.0000
6/27	1	0	0	0	0	3	0	0	0	0	0.0014	0.0000	0.0000	0.0000	0.0000
6/28	0	0	0	0	0	3	0	0	0	0	0.0014	0.0000	0.0000	0.0000	0.0000
6/29	0	0	0	0	0	3	0	0	0	0	0.0014	0.0000	0.0000	0.0000	0.0000
6/30	0	0	0	0	0	3	0	0	0	0	0.0014	0.0000	0.0000	0.0000	0.0000
7/1	1	0	0	0	0	4	0	0	0	0	0.0019	0.0000	0.0000	0.0000	0.0000
7/2	3	0	0	0	0	7	0	0	0	0	0.0033	0.0000	0.0000	0.0000	0.0000
7/3	3	0	0	0	0	10	0	0	0	0	0.0047	0.0000	0.0000	0.0000	0.0000
7/4	1	0	0	1	0	11	0	0	1	0	0.0052	0.0000	0.0000	0.0417	0.0000
7/5	2	0	0	0	0	13	0	0	1	0	0.0061	0.0000	0.0000	0.0417	0.0000
7/6	1	0	0	0	0	14	0	0	1	0	0.0066	0.0000	0.0000	0.0417	0.0000

-continue-

Appendix 11. (Continued)

Date	Daily Mortalities					Cumulative Daily Mortalities					Cumulative Proportion Mortalities				
	Chum	Chinook	Sockeye	Pink	Coho	Chum	Chinook	Sockeye	Pink	Coho	Chum	Chinook	Sockeye	Pink	Coho
7/7	0	0	0	0	0	14	0	0	1	0	0.0066	0.0000	0.0000	0.0417	0.0000
7/8	6	0	0	0	0	20	0	0	1	0	0.0094	0.0000	0.0000	0.0417	0.0000
7/9	1	1	0	0	0	21	1	0	1	0	0.0098	0.0091	0.0000	0.0417	0.0000
7/10	3	0	0	0	0	24	1	0	1	0	0.0112	0.0091	0.0000	0.0417	0.0000
7/11	2	0	0	0	0	26	1	0	1	0	0.0122	0.0091	0.0000	0.0417	0.0000
7/12	5	0	0	0	0	31	1	0	1	0	0.0145	0.0091	0.0000	0.0417	0.0000
7/13	11	0	0	0	0	42	1	0	1	0	0.0197	0.0091	0.0000	0.0417	0.0000
7/14	10	0	0	0	0	52	1	0	1	0	0.0244	0.0091	0.0000	0.0417	0.0000
7/15	12	0	0	1	0	64	1	0	2	0	0.0300	0.0091	0.0000	0.0833	0.0000
7/16	9	0	0	0	0	73	1	0	2	0	0.0342	0.0091	0.0000	0.0833	0.0000
7/17	10	1	0	0	0	83	2	0	2	0	0.0389	0.0182	0.0000	0.0833	0.0000
7/18	12	0	0	0	0	95	2	0	2	0	0.0445	0.0182	0.0000	0.0833	0.0000
7/19	23	0	1	2	0	118	2	1	4	0	0.0553	0.0182	0.0667	0.1667	0.0000
7/20	32	0	0	0	0	150	2	1	4	0	0.0703	0.0182	0.0667	0.1667	0.0000
7/21	47	2	0	0	0	197	4	1	4	0	0.0923	0.0364	0.0667	0.1667	0.0000
7/22	61	0	0	0	0	258	4	1	4	0	0.1208	0.0364	0.0667	0.1667	0.0000
7/23	68	1	0	0	0	326	5	1	4	0	0.1527	0.0455	0.0667	0.1667	0.0000
7/24	41	0	0	0	0	367	5	1	4	0	0.1719	0.0455	0.0667	0.1667	0.0000
7/25	92	0	0	0	0	459	5	1	4	0	0.2150	0.0455	0.0667	0.1667	0.0000
7/26	55	1	0	0	0	514	6	1	4	0	0.2407	0.0545	0.0667	0.1667	0.0000
7/27	112	0	0	0	0	626	6	1	4	0	0.2932	0.0545	0.0667	0.1667	0.0000
7/28	117	3	0	0	0	743	9	1	4	0	0.3480	0.0818	0.0667	0.1667	0.0000
7/29	127	0	0	0	0	870	9	1	4	0	0.4075	0.0818	0.0667	0.1667	0.0000
7/30	105	3	1	1	0	975	12	2	5	0	0.4567	0.1091	0.1333	0.2083	0.0000
7/31	97	1	1	1	0	1072	13	3	6	0	0.5021	0.1182	0.2000	0.2500	0.0000
8/1	126	5	0	0	0	1198	18	3	6	0	0.5611	0.1636	0.2000	0.2500	0.0000
8/2	71	5	0	0	0	1269	23	3	6	0	0.5944	0.2091	0.2000	0.2500	0.0000
8/3	73	9	0	0	0	1342	32	3	6	0	0.6286	0.2909	0.2000	0.2500	0.0000

-continue-

Appendix 11. (Continued)

Date	Daily Mortalities					Cumulative Daily Mortalities					Cumulative Proportion Mortalities				
	Chum	Chinook	Sockeye	Pink	Coho	Chum	Chinook	Sockeye	Pink	Coho	Chum	Chinook	Sockeye	Pink	Coho
8/4	65	12	0	0	0	1407	44	3	6	0	0.6590	0.4000	0.2000	0.2500	0.0000
8/5	78	4	0	0	0	1485	48	3	6	0	0.6956	0.4364	0.2000	0.2500	0.0000
8/6	85	4	0	1	0	1570	52	3	7	0	0.7354	0.4727	0.2000	0.2917	0.0000
8/7	91	12	0	0	0	1661	64	3	7	0	0.7780	0.5818	0.2000	0.2917	0.0000
8/8	67	7	0	0	0	1728	71	3	7	0	0.8094	0.6455	0.2000	0.2917	0.0000
8/9	54	10	0	1	0	1782	81	3	8	0	0.8347	0.7364	0.2000	0.3333	0.0000
8/10	35	6	0	0	0	1817	87	3	8	0	0.8511	0.7909	0.2000	0.3333	0.0000
8/11	33	12	0	0	0	1850	99	3	8	0	0.8665	0.9000	0.2000	0.3333	0.0000
8/12	37	3	2	0	0	1887	102	5	8	0	0.8838	0.9273	0.3333	0.3333	0.0000
8/13	47	3	0	0	0	1934	105	5	8	0	0.9059	0.9545	0.3333	0.3333	0.0000
8/14	15	2	1	0	0	1949	107	6	8	0	0.9129	0.9727	0.4000	0.3333	0.0000
8/15	26	0	0	0	0	1975	107	6	8	0	0.9251	0.9727	0.4000	0.3333	0.0000
8/16	15	0	1	0	0	1990	107	7	8	0	0.9321	0.9727	0.4667	0.3333	0.0000
8/17	13	0	0	0	0	2003	107	7	8	0	0.9382	0.9727	0.4667	0.3333	0.0000
8/18	10	1	1	0	0	2013	108	8	8	0	0.9429	0.9818	0.5333	0.3333	0.0000
8/19	8	1	2	0	0	2021	109	10	8	0	0.9466	0.9909	0.6667	0.3333	0.0000
8/20	9	0	0	1	1	2030	109	10	9	1	0.9508	0.9909	0.6667	0.3750	0.1250
8/21	9	0	0	0	0	2039	109	10	9	1	0.9550	0.9909	0.6667	0.3750	0.1250
8/22	8	0	0	3	0	2047	109	10	12	1	0.9588	0.9909	0.6667	0.5000	0.1250
8/23	12	0	1	0	1	2059	109	11	12	2	0.9644	0.9909	0.7333	0.5000	0.2500
8/24	10	0	2	3	0	2069	109	13	15	2	0.9691	0.9909	0.8667	0.6250	0.2500
8/25	12	1	0	2	0	2081	110	13	17	2	0.9747	1.0000	0.8667	0.7083	0.2500
8/26	10	0	1	0	0	2091	110	14	17	2	0.9794	1.0000	0.9333	0.7083	0.2500
8/27	7	0	0	2	0	2098	110	14	19	2	0.9827	1.0000	0.9333	0.7917	0.2500
8/28	6	0	0	0	0	2104	110	14	19	2	0.9855	1.0000	0.9333	0.7917	0.2500
8/29	11	0	0	1	0	2115	110	14	20	2	0.9906	1.0000	0.9333	0.8333	0.2500
8/30	3	0	0	1	1	2118	110	14	21	3	0.9920	1.0000	0.9333	0.8750	0.3750
8/31	2	0	0	1	0	2120	110	14	22	3	0.9930	1.0000	0.9333	0.9167	0.3750

-continue-

Appendix 11. (Continued)

Date	Daily Mortalities					Cumulative Daily Mortalities					Cumulative Proportion Mortalities				
	Chum	Chinook	Sockeye	Pink	Coho	Chum	Chinook	Sockeye	Pink	Coho	Chum	Chinook	Sockeye	Pink	Coho
9/1	6	0	0	1	2	2126	110	14	23	5	0.9958	1.0000	0.9333	0.9583	0.6250
9/2	1	0	0	0	1	2127	110	14	23	6	0.9963	1.0000	0.9333	0.9583	0.7500
9/3	0	0	0	1	1	2127	110	14	24	7	0.9963	1.0000	0.9333	1.0000	0.8750
9/4	4	0	0	0	0	2131	110	14	24	7	0.9981	1.0000	0.9333	1.0000	0.8750
9/5	1	0	0	0	0	2132	110	14	24	7	0.9986	1.0000	0.9333	1.0000	0.8750
9/6	3	0	0	0	1	2135	110	14	24	8	1.0000	1.0000	0.9333	1.0000	1.0000
9/7	0	0	1	0	0	2135	110	15	24	8	1.0000	1.0000	1.0000	1.0000	1.0000
9/8	0	0	0	0	0	2135	110	15	24	8	1.0000	1.0000	1.0000	1.0000	1.0000
9/9	0	0	0	0	0	2135	110	15	24	8	1.0000	1.0000	1.0000	1.0000	1.0000
9/10	0	0	0	0	0	2135	110	15	24	8	1.0000	1.0000	1.0000	1.0000	1.0000